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A REDESCRIPTION OF THE GENUS MIROGOBIUS HERRE (GOBIIDÆ)

By HILARIO A. ROXAS and GUILLERMO J. BLANCO

Of the Fish and Game Administration, Bureau of Science, Manila

Herre (1927) established the genus *Mirogobius* to accommodate two new species of small gobies, *M. stellatus* collected from Lanigay, Polangui, Albay Province, January 25, 1926, and *M. lacustris* collected from Laguna de Bay, Laguna Province, in July, 1926. On a field trip of the junior author, from November, 1934 to July 16, 1935, he collected species of transparent small gobies belonging to the genus *Mirogobius* from Paoay Creek and Bultong Lake, Laoag, Ilocos Norte Province. This genus is distributed throughout Luzon, although the bodies of inland waters where its species are found are separate and distinct from each other.

The study of the specimens from northern Luzon and a reëxamination of the type specimens of *M. stellatus* and *M. lacustris* collected from Laguna de Bay, warrant a redescription of the genus *Mirogobius*. The reëxamination reveals a greater fin-ray count of the dorsal and anal fins of *M. stellatus* and *M. lacustris* (Tables 1 to 3), the presence of ctenoid scales along the sides of the body of the latter, and the constant vertebral counts in both species of the genus (Table 3).

TABLE 1.—*Fin-ray counts of Mirogobius species, by Herre, 1927.*

Specimens.	Localities, Luzon.	Fin rays.		
		Anal.	1st dorsal.	2d dorsal.
M. stellatus	Lanigay, Polangui, Albay Province	I, 10	IV rarely V	I-7
M. lacustris	Laguna de Bay, Laguna Province	I, 8 to 9	V rarely IV	I-7

TABLE 2.—*Fin-ray counts of type specimens and new specimens of Mirogobius, July, 1935.*

No.	Specimens.	Localities, Luzon.	Fin rays.		
			Anal.	1st dorsal.	2d dorsal.
19	*M. stellatus*	Lanigay, Polangui, Albay Province.	I, 8 to 13	V rarely IV	I, 7 to 9
21	*M. lacustris*	Laguna de Bay, Laguna Province.	I, 10 to 13	V rarely IV	I-7 to 9
40	*M. lacustris*	Paoay Creek, Paoay, Ilocos Norte Province.	I, 10 to 13	V rarely VI	I-7 to 9
31	*M. lacustris*	Buttong Lake, Laoag, Ilocos Norte Province.	I, 9 to 12	V rarely IV	I-7 to 8

TABLE 3.—*Vertebral counts of the species of Mirogobius of Luzon.*

Number of specimens.	Species.	Localities, Luzon.	Vertebral count of each.
19	*M. stellatus*	Lanigay, Polangui, Albay Province	25
20	*M. lacustris*	Laguna de Bay, Laguna Province	25
23	*M. lacustris*	Paoay Creek, Paoay, Ilocos Norte Province	25
24	*M. lacustris*	Buttong Lake, Laoag, Ilocos Norte Province	25

Genus MIROGOBIUS Herre

Mirogobius HERRE, Gobies of the Philippines and the China Sea. Philip. Bu. Sci. Monograph 23 (1927) 91.

Dorsal V, rarely IV or VI; I, 7 to 9; anal 1, 8 to 13; skin naked or with minute ctenoid scales along sides of body.

Head robust, blunt, with large oblique mouth; each jaw with a single row of long, stout, curved, widely spaced teeth; a pair of postsymphysial canines in lower jaw behind outer row; in one species canines present only in males; tongue notched; gill openings large, extending along throat; isthmus narrow, branchiostegals five. Body slightly compressed laterally; number of vertebræ 25; dorsals far apart; pectorals rounded; ventrals form subtubulate sucking disc; caudal subtruncate with rounded corners.

Revised key of the Philippine species of Mirogobius.

a^1. A pair of postsymphysial canines present in lower jaw of both male and female; anal 1, 8 to 13; dorsal fins V, rarely IV; I, 7 to 9; color darkened by many dark stellate spots.......... *M. stellatus* Herre.

a^2. A pair of postsymphysial canines present in lower jaw of male only; anal I, 8 to 13; dorsal fins V, rarely VI; I, 7 to 9; color transparent yellow or creamy white with a few black spots on the head, chin, and along sides of body.......... *M. lacustris* Herre.

MIROGOBIUS STELLATUS Herre.

Mirogobius stellatus HERRE, Gobies of the Philippines and the China Sea. Philip. Bu. Sci. Monograph 23 (1927) 92, pl. 6, fig. 4.

Head 3.4; depth 4.2 to 5.2; first dorsal V, rarely IV; second dorsal I, 7 to 9; anal I, 8 to 13.

Body slightly compressed laterally, with an elongate, dorsal profile slightly convex in male, much arched in females; greatest depth at level of first dorsal and ventral.

Head with short, blunt, and rounded snout, equal to eye diameter; eyes lateral, high up; interorbital space broad, equal in eye diameter; mouth large, strongly oblique; lower jaw and chin strongly projecting, with posterior angle of maxillary below front margin of middle eye. Teeth in males and females with postsymphysial canines. Body naked, with tough skin only. Number of vertebræ 25.

First dorsal composed of five, or rarely four, slender spines connected with membranes, the first or the second the longest, the fourth spine slightly shorter than the third, the fifth much shorter than the fourth; the second dorsal falling far short from the first dorsal; second dorsal and anal fins similar in shape, angulate posteriorly, the rays of both of nearly uniform height; caudal bluntly rounded, 4 to 4.5 times in length, shorter than length of head. Pectoral broad, rounded 1.5 times in head; ventrals small, narrow, pointed, subtubulate, 2 times in head. Anal papilla short, thick, cylindrical in females, very elongate, slender and pointed in males.

Color in alcohol varies from yellowish to brownish, with small black stellate spots, with a clear linear space longitudinally from axil of pectoral to the caudal. Top of head, snout, and cheeks, blackish spotted; first dorsal finely specked with dusky or entirely colorless, the other fins more or less thickly dotted with fine black specks, the ventrals colorless.

Nineteen male and female specimens, 16 to 19 millimeters, from the type specimens collected January 25, 1926, at Lanigay, Polangui, Albay Province, have been reëxamined (Table 2).

MIROGOBIUS LACUSTRIS Herre.

Mirogobius lacustris HERRE, Gobies of the Philippines and the China Sea. Philip. Bu. Sci. Monograph 23 (1927) 93, 94; Notes on Fishes in the Zoölogical Museum, Stanford University. Fishes Herre Philip. Exped. 1931 (1934) 81.

Head 3.5; depth 4.3; first dorsal V, rarely IV or VI; second dorsal I, 7 to 9; anal I, 8 to 13.

Body laterally compressed, caudal peduncle elongate, dorsal profile slightly convex; greatest depth at level of first dorsal and ventral.

Head large, blunt, and heavy in males, slender in females, snout very wide and blunt in males, narrower and equally blunt in females; eyes high up and lateral; interorbital space wider than eye diameter; mouth large and strongly oblique with projecting lower jaw, chin strongly rounded and oblique, with posterior angle of maxillary beneath front margin or anterior portion of eye. Teeth in males long, stout, curved, widely spaced; those of the lower jaw visible when the mouth is closed; pair of canines present behind symphysis of lower jaw, back of outer row of teeth; in female minute teeth in one row; pair of inner canines in lower jaw absent. Gill openings large, isthmus narrow, branchiostegals five.

Scales along sides of body microscopic, distinctly ctenoid, with about 4 to 15 spines on their exposed posterior. Vertebræ, 25.

First dorsal, slender spines, second, third, and fourth longest, fifth branched and shortest. First dorsal half the length of second; second dorsal and anal of similar shape, angulate posteriorly, falling far short of caudal when depressed. First anal spine ahead of the first spine of the second dorsal. Pectoral rounded, shorter than the head in length and reaching the level of the last ray of the first dorsal fin. Ventrals fused, with the broad frenum forming a deep sucking disc, 2.5 into the head. Caudal subtruncate, with rounded corners, less than the head in length.

Color in life transparent yellowish, or creamy white with a few black spots on the head, chin, and long dorsal and ventral sides of body, fins colorless.

Color in alcohol creamy white, with black spots on chin, head, and along sides of body.

Twenty-one specimens of *M. lacustris*, from the collection of July 23, 1935, from Laguna de Bay, Laguna Province, 49 specimens collected July 5, 1935, from Paoay Creek, Paoay, and 31 specimens collected July 5, 1935, from Buttong Lake, Laoag, Ilocos Norte Province, have been examined (Table 2).

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THE FISHERIES OF LAKE MAINIT AND OF NORTHEASTERN SURIGAO, INCLUDING THE ISLANDS OF DINAGAT AND SIARGAO

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ONE PLATE AND TWO TEXT FIGURES

Surigao Province (Plate 1) lies along the northeastern part of the mainland of Mindanao. It is elongate in shape, and roughly indented along the northern and eastern coasts by a number of bays and coves. It is separated at its western boundary from Agusan Province by Diwata Mountain. Along its northeastern portion are two large islands; namely, Dinagat and Siargao, both interspersed with many islets in their coves and straits. As the province is rugged and rocky, most of the towns are located along the seacoast, where fishing is one of the important industries.

Around the larger islands and islets, especially in Dinagat Cove and Melgar Bay, fish and shellfish of various kinds are found in commercial quantities during certain seasons of the year. The waters between the islets under the jurisdiction of Dinagat and Surigao are not directly exposed to the prevailing monsoons.

In the mainland, between the provinces of Surigao and Agusan, is Lake Mainit, one of the largest crater lakes in Mindanao and second in size only to Lake Lanao. It lies at 9° 25' north latitude and 125° 25' east longitude. It is bounded in the north by the town of Mainit and in the south by Jabonga. The outlet of the lake is located near the latter; along the west is a high mountain ridge, and along the east and south is a portion of the plains of Agusan Province.

The lake is roughly trapezoidal in outline, with an estimated area of about 75 square kilometers. The long diameter extends north and south and measures about 15 kilometers; the short diameter is about 5 kilometers.

The main supply of the water in the lake comes from three main rivers; namely, Pugo, Magpayang, and Sinaiñgan. Abundant rainfall in the locality and a number of small springs emptying into it provide a good supply of water in the lake. The outlet, Jabonga-Tubay River at its southern end, flows into another lake, Lake Pagusi. This lake has an approximate area of about 4 square kilometers. It derives its name from a water lotus, called *pagusi* (*Nymphæa* sp.), with which it is mostly covered. Only a few people fish in this lake because of the abundance of crocodiles.

Lake Mainit is surrounded by gradually sloping, sandy and gravelled shores, except for a portion along the eastern border, called Kabatohan, which is roughly indented, stony, and rocky. The shore along the western border is abruptly sloping. There are, however, some parts along the mouths of rivers flowing into the lake where muddy bottom may be found. The water of the lake is very clear, and the surface stands about 82 feet above sea level during the greater part of the year. The shore is narrow, except along the northern and eastern sides, and descends abruptly to a considerable depth. About a kilometer from the shore, according to fishermen, a depth of 15 to 20 brazas has been recorded. The greatest depth is, however, reported to be about 82 brazas (150 meters).

The lake is rich in plant life. Along the littoral area tape grass (*Vallisneria* sp.) and cat tails (*Ceratophyllum demersum* Linn.) are abundant. Water lotus and a few water hyacinths abound near the mouths of rivers. Filamentous algæ are found on the littoral area, growing on the gravelly and sandy bottom. The presence of these filamentous algæ in abundance in many portions of the lake is, undoubtedly, an ideal condition for the growth of bañgos (*Chanos chanos* Forskål). It is surprising, however, that, although balanak (Mugilidæ) abound in the lake during certain seasons of the year, no catch of bañgos has been recorded, probably due to the exceptionally high elevation of the lake, which makes it impossible for young bañgos going upstream to reach it.

FISHERIES OF LAKE MAINIT

Although there is no record of fish caught in this lake, its fisheries must have played a significant rôle in the economic life of the inhabitants. Both the fishermen and municipal officials, especially those residing along the Jabonga River, believe that there has been a gradual decline in the catch from the lake and its outlet, accompanied by the gradual disappearance of the few commercial species that used to abound there.

In spite of the fact that fishing has been carried on in the lake since the early days of the Spanish regime and probably even earlier, no restriction of any form to conserve the fishery resources of the lake has been imposed by the constituted authorities. With the rapid increase in population around the lake and neighboring provinces, the fishery will be subjected to further strain, and if adequate conservation measures to increase or rehabilitate the fishery resources of the lake are not put into effect, the latter are bound to be exhausted.

Lake Mainit is under the jurisdiction of the municipality of Mainit, Surigao Province, and of Jabonga, Agusan Province. Since the recognition of the municipality of Mainit in 1910, ordinances relating to the taxation for the privilege of fishing in the lake have been enforced on different fishing appliances.

Along the southern end of the lake where the outlet is located, the Municipal Council of Jabonga opens a yearly lease for the privilege of fishing in Jabonga River and along the shores of the lake under its jurisdiction. The leasing of the mouth of Jabonga River began in 1920 with a yearly fee of 250 pesos. A fish corral is constructed at the mouth to catch fishes migrating to the sea. Since 1920 the fee has increased constantly, due to the increasing number of bidders. During the survey (1936) the fee was set at 1,350 pesos per annum.

The lower portion of Jabonga River, called Tubay River, belongs to the municipality of Cabadbaran. Along this river there are a number of *pasakis* and *paluksukan* (fish corrals) set across the stream to catch fishes migrating to the sea. These fish corrals are also leased to the public for 20 to 30 pesos each a year.

No steps toward the conservation of the fishery were taken until an ordinance was passed by the provincial board, providing, among other things, a gateway of 10 meters along one side of the river to serve as an escape for migrating fishes and as a passage way for barotos and launches navigating along the river.

The principal species found in the lake are *pidianga* (*Glossogobius* spp.); *balanak* (*Mugil* spp.); *guingao* (*Lutianus argentimaculatus*); *lañgob* (*Caranx* spp.); *casili* (*Anguilla mauritiana*); and *haruan* (*Ophicephalus striatus*). The following are caught in lesser quantities: *puyo* (*Anabas testudineus*); *kikilo* (*Scatophagus argus*); *bukoko* (*Pomadasys hasta*); *hipon* (Gobiidæ); *buagan* (*Ophiocara* sp.); *bolinao* (Phallostethidæ); *pegok* (*Therapon* sp.); *donulan* (Leiognathidæ); *pantat* (*Clarias batrachus*); *suasih* (Hemiramphidæ); and *gabot* (*Rasbora* sp.).

Snails, mostly *hapiosan* (*Vivipara angularis*) and *cabuay* (*Ampullaria* sp.) abound in the lake. Shrimps (*Palæmon* sp.) and *uyap* (*Palæmon* sp.) are occasionally caught. The abundance of snails in the lake may give rise to a flourishing duck industry in the future.

The more important fishes caught in the lake, together with a conservative estimate of the income derived from each, and their fishing seasons, are shown in Table 1.

TABLE 1.—*Important fishes caught, income derived therefrom, and fishing seasons in Lake Mainit.*

Common name.	Family.	Annual income.	Season.
		Pesos.	
1. Pilianga	Gobiidæ	12,000	Throughout the year.
2. Guingao	Lutjanidæ	8,000-10,000	April to May.
3. Lag̃ob	Carangidæ	3,000- 5,000	Throughout the year.
4. Balanak	Mugilidæ	3,000- 5,000	December and January
5. Casili	Anguillidæ	1,000- 2,000	December to February.
6. Miscellaneous		6,000	Throughout the year.
Total		32,000-39,000	

The total value of the fisheries of Lake Mainit is conservatively estimated at about 40,000 pesos annually.

COASTAL FISHERIES

The municipal income from coastal fisheries is derived from the license fee levied on the various fishing appliances used in their respective localities. As elsewhere in the Philippines, there is no actual record of the catch of each gear. Only recently a campaign for the collection of fishery statistics, with the coöperation of the provincial and municipal treasurers, has been started in Fishing District No. 9, which comprises northern Mindanao and Davao Provinces.

TABLE 2.—*Income by municipalities from fisheries for 1935.*[a]

	Pesos.		Pesos.
Bacuag	165.60	Liñgig	156.00
Bislig	149.50	Loreto	247.50
Cantilan	112.50	Mainit	126.95
Carascal	205.50	Numancia	158.00
Dapa	425.00	Placer	425.05
Dinagat	1,108.00	Surigao	432.70
General Luna	78.20	Tago	67.50
Gigaquit	154.50	Tandag	121.00
Hinatuan	570.50		
Lanuza	20.00	Total	5,071.20
Lianga	327.00		

[a] Data by courtesy of the Provincial Treasurer of Surigao Province.

Table 2 shows that Dinagat, Hinatuan, Surigao, Placer, and Dapa, named in the order of their importance, are the towns where fishing as an industry is active and extensive.

Dinagat.—Dinagat is a small town located on Dinagat Island. As the island is thickly forested and rocky, the main occupations of the people are fishing and lumbering. Very recently chromite deposits were located in the regions around Dinagat, and many people began to turn their attention to mining. Primarily, however, Dinagat is a fishing town, its fisheries being confined in and around the islets of Cabilan, Capaquian, and Rizal. As a matter of fact, this region, including Melgar Bay, is considered the best fishing center of northeastern Surigao Province.

Deep and shallow fish corrals dot the coves and bays of Dinagat Island during the northeast monsoon. Anchovies (*dumodot*), mackerel (*haul-haul*), sardines (*tamban-tuloy*), two-finned runners (*salinduta*), and *tuliñgan* (Thunnidæ) are caught in abundance from November to April. Although the last-named species is caught almost throughout the year, it is most abundant from January to April when sardines are also caught with them.

The *lampara, lawag,* or *sapiao* is extensively used in Dinagat Island. It must have been introduced by the fishermen from Leyte and Samar. During the survey (November to December, 1936), 34 lamparas with from 500 to 1,000 candle power were in operation. A lampara outfit pays an annual license of 60 pesos to the municipality of Dinagat. The catch of lampara, which consists principally of anchovies, is mostly salted and marketed in Bohol, Cebu, and Surigao. Very little of the fresh catch is marketed locally.

In Barrio Osmeña extensive diving is done by natives for mother of pearl and *Trochus*. The pearling grounds are reported to be quite extensive.

Loreto.—Loreto is another small town, located at the northern end of Dinagat Island. It is primarily a fishing town, situated at the head of Loreto Cove. Tuliñgan, *trakito,* dumodot, and tamban-tuloy are caught in fairly large quantities by fish corrals. Lampara is also used in small shallow coves. Trolling in Surigao Strait is extensively done in times of fair weather.

Whales, probably the black-fin, are reported to be caught near Loreto during the summer months (March to May). Stranded whales are frequently reported between Desolation Point and Homonhon Island.

Surigao.—Surigao, the capital of the province, is located at the head of a cove. It is the market center for agricultural and fish products, and its municipal waters are rich fishing grounds. The barrios of Lipa, Sabang, Lipata, and Ipil are the most important fishing banks of Surigao. Ipil is worth mentioning here for its valuable *nocus* (*Loligo* sp.) fishery, which yields an approximate income of about 5,000 pesos yearly.

The nocus is principally caught by pukot throughout the year. A pukot outfit of 10 by 50 brazas costs from 400 to 500 pesos. It is operated very much like the *sapiao con luces*. Strong lights, ranging from 500 to 1,000 candle power, are used in connection with the operation of this pukot. Nocus fishing is only possible during the dark of the moon and when the sea is calm and the water clear.

Dangit (*Amphacanthus* sp.) is caught by shallow-water fish corrals (*pahubas*) from December to April, when inshore winds prevail. From August to October no fish corrals can operate in the municipal waters of Surigao on account of the strong southwest monsoon.

Infrequently, muro-ami fishermen from Mambajao, Camiguin, operate in some suitable portions of Surigao, and their enormous catch is usually marketed there. When they have enough ice in their hold, large catches are taken to Mambajao, Catarman, and Sagay.

The eastern portions of Surigao proper are wide strips of marshy land, suitable for bañgos raising. From Lipata point to Surigao River there are about 400 hectares of timber block which can be very well developed into bañgos fishponds as population and demand for fish increase.

Baling, *bungsod*, lampara, and *pukot* are the most important gear used in the locality.

Placer.—Placer is a mining town, located at the head of a semiopen cove. This place is for the most part protected from the northeast monsoon by the islands of Lakandola, Talavera, and Opong. Fishing is a minor industry, in spite of the fact that the waters teem with many commercial species of fish. Most of the laborers in the locality are recruited into the mining industry.

Both shallow and deep fish corrals are found around the small islands of Lakandola, Talavera, and Opong. In this locality lampara is also extensively used for catching anchovies and sardines almost throughout the year. When large hauls of those fishes are taken, they are marketed in Badas, the junction of the three roads from Surigao, Mainit, and Placer.

The sea bottom of the coastal region is more or less stony, in most parts inhabited by several kinds of rock fishes. Various kinds of fish traps, such as *panggao* and *liguid*, similar to those used in the Visayan Islands, are frequently employed.

Mother of pearl, *Trochus*, and other kinds of commercial shells have been reported abundant around the small islands under the jurisdiction of Placer.

Bacuag.—Bacuag is a small agricultural town about 15 kilometers from Placer along the shore. Although fishing is not a very important industry there, baling and lampara are sometimes employed for catching anchovies and round herrings (Dussumieridæ).

Gigaquit.—Gigaquit is a mining town about 20 kilometers from Bacuag. Fishing is not carried on very extensively there. However, a few shallow fish corrals and baling are used by a number of fishermen for catching mackerel, sardines, and sometime tuliñgan.

Siargao.—Siargao is a small island about the size of Siquijor Island, with the important fishing municipalities of Dapa and Numancia located along the southwestern coast.

Bungsod, lampara, and baling are the most common gear used for catching *dumodot* (anchovies), *haul-haul* (sardines), and *tegué* (*Scutengraulis* sp.). The important fishing grounds are around the small islets west and south of Siargao and around Bucas Grande Island.

FISHING METHODS

In Lake Mainit, its tributaries, and its outlet, the fishing gears used are baling, paluksuhan or *bisig*, bungsod, *dumpil*, *salibot*, and *sarap*.

Baling.—The baling (chinchorro in the Visayan Islands) is a drag seine made of woven abacá. It is provided with a long conical bag flanked by two long tapered wings of equal size. It is operated by six to ten men along the shallow sandy shores of the lake. The head ropes are provided with wooden floats, and the bottom with lead sinkers. A complete outfit costs from 30 to 40 pesos, including two small *barotos*.

The major catch consists of pidianga admixed with bolinao and buagan.

Paluksuhan (*text fig. 1*).—The paluksuhan or *bisig* consists of a barricade with two wings and a catching trap at the rear. This is set across shallow flowing streams to catch fishes going down stream to the sea to spawn. The barricades are made of wooden poles with fillings of stones along their bases in order to keep them from being carried away by strong floods. The terminal portion consists of a sliding platform and a collecting trap (*abo-abo*). The sliding platform is made of *banela* set as flooring with an inclination of about 30 degrees. When a migrating fish touches the platform, it is tossed to the collecting trap by its own force.

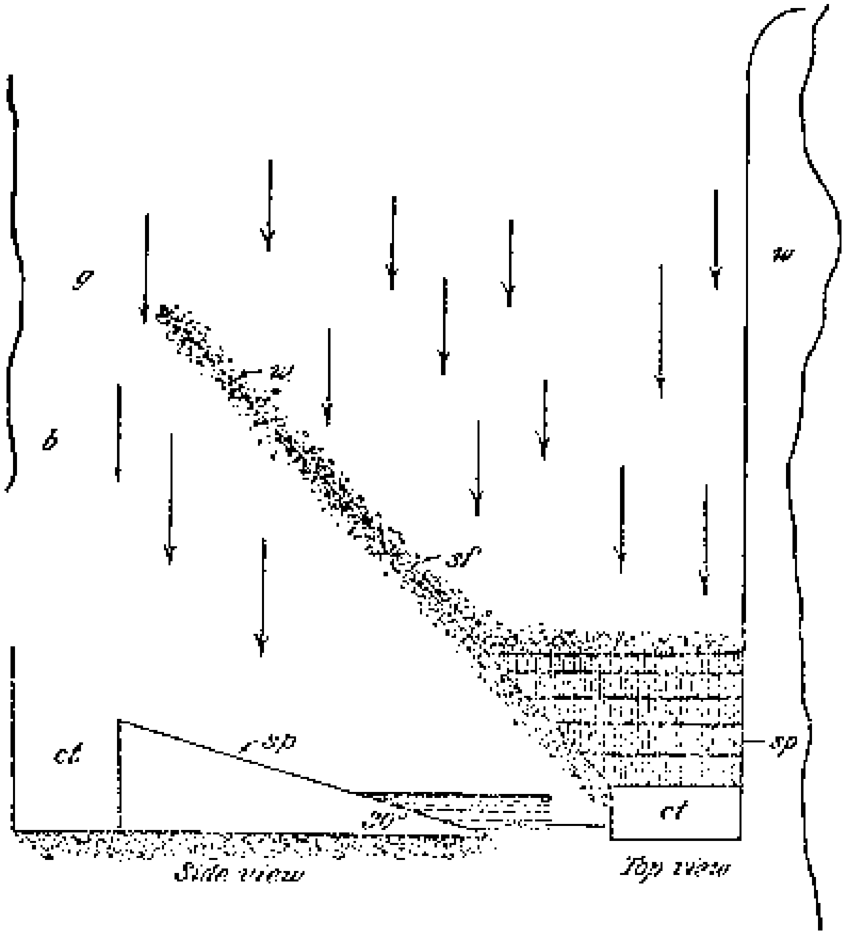

FIG. 1. Diagram of palukuhan. w, Wing (panampas); sp, sliding platform; ct, collecting trap (abo-abo); g, gateway; b, river bank; sf, stone fillings.

During the survey in December, 1936, there were about five traps of this kind along the Jabonga-Tubay River. These traps are set not less than 200 meters apart as required by the municipal ordinance of Cabadbaran, Agusan.

Bungsod (*text fig. 2*).—Bungsod is a fish corral seldom used in the lake proper because the bottom of the lake is sandy and the shoreline very narrow. At the mouth of Jabonga River, a bungsod is constructed in a similar way as the *baklad* of Butas River in Mindoro and Pansipit River in Batangas. It has a wing almost closing the mouth of the river and a terminal pound on one side. A watch house is constructed on top of the terminal pound.

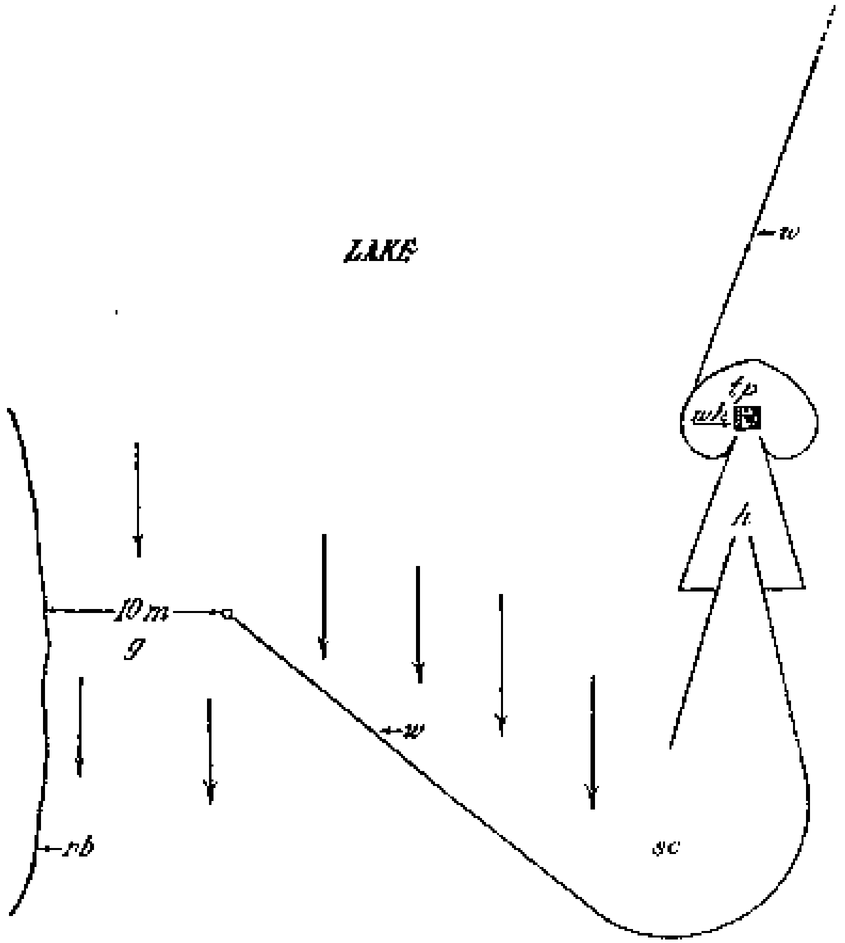

FIG. 2. Diagram of bungsod at the mouth of Jabonga River. w, Wing (pañganpad); sc, semicircle (buwa); tp, terminal pound (bunoan); wh, watch house (bahay-bahay); h, first heart; g, gateway; rb, river bank.

The catch consists principally of casili, lañgob, guingao, balanak, haruan, and bulan-bulan.

The operation of this bungsod at the mouth of Jabonga River gives a good income to the municipality of Jabonga from leases.

Dumpil.—The dumpil consists of two bamboo screens (*banata*) set in a semicircle at the end of a dug-out canal or in small streams. It catches haruan only when the water of the lake rises to the level of the canals.

Salibot.—The salibot is a small rectangular net made of cotton twine (Nos. 20 and 40), provided with wooden floats and lead sinkers. It is operated like a drag seine. In some places the salibot is called *pukot*. It catches, for the most part, haruan and paniat. Two to four men are needed to operate the outfit.

Sarap.—The sarap is a scissor net made from woven abacá locally called *baliñgonon*. It is operated by a single person along the banks of Jabonga-Tubay River. The catch consists mostly of uyap and larval fishes.

Fishing in northeastern Surigao, as in other regions of northern Mindanao, is confined to the region along the shore. Fishing is mostly carried on in dug-out bancas which cannot stay out at sea more than one day, and which cannot withstand bad weather conditions. The nets used are generally made of finely woven abacá cloth (baliñgonon), which is much cheaper than cotton-thread nets. Most of the gear used locally were perhaps introduced by the fishermen from Luzon and Visayan Islands.

Only the important gear and those extensively used are mentioned in the following paragraphs.

The lampara.—The lampara is considered the most important fishing gear used in Surigao, especially in and around the vicinities of Dinagat cove and Melgar Bay, where anchovies are caught in commercial quantities. Anchovy fishing commences as early as October and extends up to March.

A lampara outfit consists of the lamparahan and a net or *baling*. The lamparahan consists of two dug-out bancas which are connected by a sort of platform with a mounted tripod rack on which the lamp (lampara) is hung. A lamparahan may be provided with one or two "Hasag" or "Petromax" lamps, with 500 to 1,000 candle power. Besides being used as a landing platform, the lamparahan is used for loading and transporting the net and catch to and from the fishing ground.

The net or baling consists of a rectangular beach seine of abacá cloth, which is operated in a similar way as the *sapiao con luces*. It is usually about 200 feet long and 15 feet wide at the wings and 25 feet at the bunt. The sides of the net are selvaged with hand-made abacá twine about one-eighth inch in diameter with a mesh of about two inches stretch. The upper line is provided with wooden floats and the bottom with lead sinkers. The ends of the wings are provided with pull ropes for hauling in the net. In operation it is converted into a huge dip net hauling in the bottom line.

From six to ten men are needed to operate the net. These men set out to sea early in the afternoon, and upon reaching the fishing ground, about dusk, they light the lampara. The lamparahan drops anchor and lies in wait, while most of the crew go to sleep. One man, usually the steerman, is assigned to watch the light. When large schools have been attracted, the steerman wakes up the rest of the fishermen. The lampara escorts the school into the net which has been laid out in the form of a semicircle. When the school of fish has been enclosed, the bottom ropes are pulled to form a sort of dip net; then the net is hauled in until the fish are impounded in the bunt, whence they are brailed out by means of dip nets (*sigpao*).

A lampara outfit involves the following expenditures: For the lampara (one lamp, 1,000 candle power), 60 pesos; for the net (including all accessories), 40 pesos; for the lamparahan (two barotos), 40 pesos; or a total of 140 pesos. One 1,000-candle power lamp consumes 30 to 40 centavos worth of petroleum a night.

The catch consists chiefly of anchovies mixed with a large amount of larval forms of other fishes. The value of anchovy fisheries alone in Dinagat cove and Melgar Bay may be placed at from 10,000 to 20,000 pesos every fishing season.

The bungsod (fish corrals).—This fishing appliance used in the coastal waters of Surigao Province is next in importance to the lampara. It is usually placed in position from November to March and removed at the commencement of the southwest monsoon in May or June.

Various types of bungsod are in use. The most common forms employed are the *tinagalog* or *paugmad*, the *pandomodot*, and the *pakubas*.

The tinagalog, as its name indicates, is a fish corral introduced by the Tagalogs. It is primarily adapted to waters varying from 5 to 10 fathoms in depth. This type is not usually provided with a pound or crib. The catch is taken by brailing with the use of a drag net, locally called *siguin*. This kind of fish corral may cost from 1,000 to 3,000 pesos, depending upon its size and the depth of its location.

The fish corral pandomodot derives its name from *domodot*, an anchovy, which forms its principal catch. It is similar to the *inangela* type of fish corral used in Samar and Leyte. It is set in waters of from 2 to 6 fathoms in depth. It may have one or two pounds on each side. It requires an investment of one to two hundred pesos.

The pahubas is a shallow type of fish corral set along the shallow tidal flats (*hunasan*) frequented by fishes, such as dangit (Amphacanthidæ), goatfishes (Mullidæ) and other rock fishes. It consists of a terminal pound with two semicircular inclosures superimposed upon the former, and with two diverging wings. A pahubas may cost from thirty to fifty pesos.

Baling.—The baling consists of a beach seine of abacá cloth, operated very much like the pukot in Luzon. It may or may not be provided with a bag (*supot*). It is operated on smooth, sandy or muddy bottoms, by from six to ten men, depending upon the size of the outfit. When it is operated at night a strong light is used with it.

FISH-PRESERVATION METHODS

The fish caught in Lake Mainit are much in demand in the nearby towns, and most of them are sold in the fresh state. Pidianga, which are frequently caught in considerable quantities, are sold in the fresh state in Mainit and Bacles. However, during the height of the fishing season of balanak and guingao, when there is an oversupply of fresh fish, they are salted, dried, and marketed in the neighboring inland towns of Surigao and Agusan.

In Dinagat cove and Melgar Bay, where large hauls of anchovies and round herrings are made, fish preservation is very important. During the survey, however, no regular preservation plants similar to those found in Estancia and Catbalogan were seen. The enormous catch are usually salted in the houses of individual fishermen.

The most common methods of fish preservation are drying and salting. The former method is used with big fishes, such as *anduhao* (Scombridæ) and *tamarong* (Carangidæ), which are frequently caught in big quantities. The fish is opened at its back, salted, and dried under the sun. Anchovies are seldom dried; they are prepared into a popular product locally called *guinamos.*

Two methods of salting are employed in making guinamos in Dinagat; namely, the *sinabado* and the *jinusto*. When the guinamos is intended for short storage, the ratio of two gantas of salt to one ganta of fish (anchovies) is used. This *sinabado* method is also resorted to when there is a shortage of salt.

In the jinusto method, the ratio of three gantas of salt to one ganta of fish is used.

In the making of guinamos the fish is first washed in sea water to remove any dirt or foreign material that may be clinging to it. The bigger fishes are removed in order to assure a uniform rate of fermentation. Salt and fish are thoroughly mixed in proper proportions on a mat or in one end of a banca. Then the mixture is packed in petroleum cans. After two or three days the cans are sealed. They are marketed in Bohol and Cebu where there is a great demand for them. A can of guinamos costs from 1.50 to 2 pesos.

FACTORS OF DEPLETION IN LAKE MAINIT FISHERIES

Overfishing and depletion of both the breeders and fry are the main factors that affect the supply of fish in a given body of water. Sometimes some natural environmental factors also affect the abundance of fish. Dry seasons are at times responsible for wholesale dying of fishes in the lake. When the temperature is high, the rate of algal multiplication is rapid, so that during the dry season, when the volume of water in the lake is less, the amount of algæ per unit volume of water is great. At night, especially when there is no photosynthetic liberation of oxygen, the amount of oxygen in the water becomes less than the minimum requirement of the fish in the lake. The dead and putrifying algæ possibly also liberate poisonous substances. These conditions, together with the low oxygen content of the water, perhaps lead to the death of fishes. Similar conditions have been noted in Lake Naujan and Laguna de Bay during the summer months.

Because of the depth of the lake there is no danger of seriously depleting its permanent fish residents. The migratory species, however, have already shown signs of decline. The fish corral at the mouth of Jabonga River catches almost all migrating fishes. The sarap along the Jabonga-Tubay River also catches the fry of these migratory species. These destructive practices of the fishermen are mainly responsible for the depletion of the fisheries of the lake and the river.

The decrease in the supply of fish and the gradual disappearance of certain commercial species are now being complained of by the residents of Mainit and Jabonga, although this apparent decline cannot be shown by statistics due to the absence of reliable records. Fluctuations occur, as is to be expected, in any fishery. As long as the record of catch per unit of gear or effort and the statistics of catch are unknown, the actual rate of depletion cannot be determined.

As far as can be ascertained, the alleged decrease in the quantity of fish supply in the lake may be attributed to the following: (1) A gradual lowering of the water level of the lake during recent years; (2) bad water brought about by the decay of algæ during certain seasons of the year; (3) the increase in population around the lake, which has intensified fishing activity and which in turn has taxed to the limit the capacity of the species to maintain themselves; and (4) the unrestricted catching of both the breeders and fry of migratory species.

RECOMMENDATIONS

The following recommendations, if followed, might serve to remedy the present situation of Surigao fisheries, and may likewise increase the fish population in Lake Mainit.

1. For the protection of the fry of the fishes, principally those of the migratory species, the use of *sarap* along the Jabonga-Tubay River should be prohibited.

2. For the protection of both the fry and the breeders, the two mouths of Tubay River, Cabadbaran, Agusan Province, should be declared fish reserves or sanctuaries. The reserved area should cover at least 50 meters on each side of the mouth and a radius of about 100 meters toward the sea, drawn from the base of the mouth, and 100 meters inside the river.

3. An extensive campaign against the use of fish poisons (*tubli* and *lagtang*) should be undertaken in order to minimize the destruction wrought by these poisons.

4. Studies on the migration and biology of important species should be undertaken in order that proper legislation may be promulgated.

5. Transplantation of young bañgos should be experimented with. If it proves successful, it will increase the number of bañgos breeders in Butuan Bay and likewise the fish supply in the lake.

6. The important fishing bank in northeastern Surigao, around Dinagat Cove and Melgar Bay where the anchovy is most abundant, should be exploited.

7. The mother of pearl and *Trochus* fisheries in and around Dinagat Island and possibly around the small islets under the jurisdiction of Surigao should be developed.

8. Studies on the habits and life histories of the more important fishes along the shores should be undertaken in order that proper protective regulatory measures may be formulated and enforced.

9. The eastern coastal regions of Surigao proper and around the numerous islets are rich in corral reefs which teem with various commercial species of rock fishes and should be recommended for muro-ami fishing.

10. Suitable places for bañgos culture between Lipata Point and Surigao River should be developed and utilized to stabilize the fish supply.

11. In making guinamos, the people should be made to observe sanitary rules, to use a better quality of salt, and to employ earthen jars in fermenting the fish.

ILLUSTRATIONS

PLATE 1

Map of northeastern Mindanao, showing Lake Mainit and adjacent islands.

TEXT FIGURES

FIG. 1. Diagram of paluksukan. *w*, Wing (pañgampac); *sp*, sliding platform; *ct*, collecting trap (abo-abo); *g*, gateway; *b*, river bank; *sf*, stone fillings.

2. Diagram of bungsud at the mouth of Jabonga River. *w*, Wing (pañgampac); *sc*, semicircle (buwa); *tp*, terminal pound (bunuan); *wh*, watch house (bahay-bahay); *h*, first heart; *g*, gateway; *rb*, river bank.

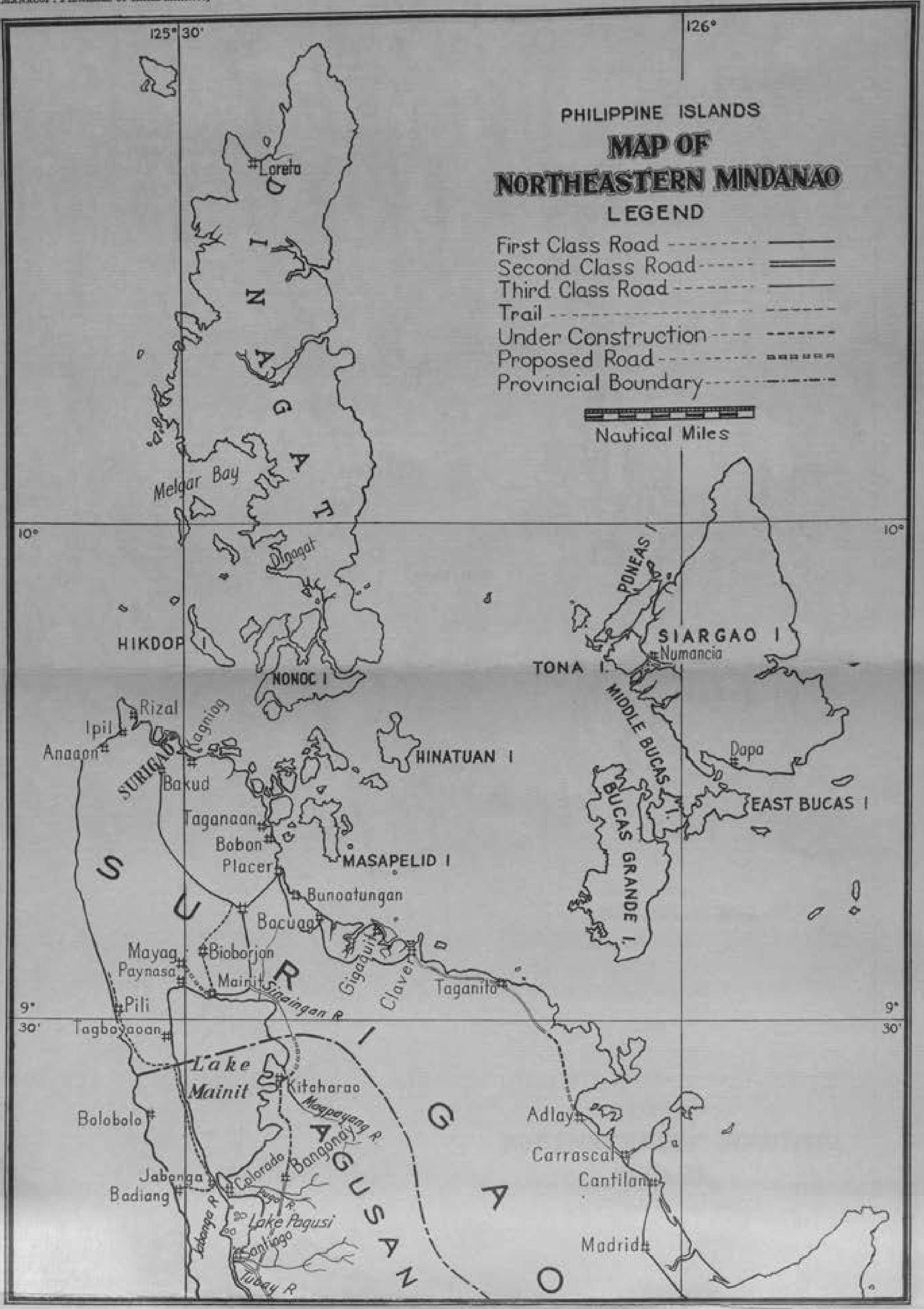
PHILIPPINE ISLANDS
MAP OF
NORTHEASTERN MINDANAO
LEGEND
First Class Road
Second Class Road
Third Class Road
Trail
Under Construction
Proposed Road
Provincial Boundary
Nautical Miles
125° 30'
126°
10°
9° 30'
DINAGAT
Loreto
Melgar Bay
Dinagat
HIKDOP I
NONOC I
HINATUAN I
MASAPELID I
SIARGAO I
Numancia
TONA I
PONEAS I
MIDDLE BUCAS I
BUCAS GRANDE I
EAST BUCAS I
Dapa
Rizal
Ipil
Anaaon
SURIGAO
Nagniog
Bakud
Taganaan
Bobon
Placer
Bunoatungan
Bacuag
Gigaquit
Claver
Taganito
Mayag
Bioborjan
Paynasa
Mainit
Sinaingan R
Pili
Tagbayaoan
Lake Mainit
Kitcharao
Magpayang R
Bolobolo
Jabonga
Badiang
Colorado
Bangonay
Jabonga R
Lake Pagusi
Santiago
Tubay R
Adlay
Carrascal
Cantilan
Madrid
SURIGAO
AGUSAN

PLATE 1.

PYGIDIOPSIS MARIVILLAI, A NEW HETEROPHYID TREMATODE FROM THE PHILIPPINES

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Of the School of Hygiene and Public Health, University of the Philippines Manila

ONE PLATE

While investigating, in connection with other work, the parasitic fauna of the small intestines of different Philippine fish-eating birds, we encountered in a white-breasted sea eagle, *Haliæetres leucogaster* (Gmelin), several flukes, apparently of the same species of the genus *Pygidiopsis* Looss. Since 1907, when Looss erected this genus for the species *P. genata*, no other species had been found. The name *Pygidiopsis marivillai* is proposed for our Philippine species.

PYGIDIOPSIS MARIVILLAI sp. nov. Plate 1, fig. 1.

The present description is based on thirty-two adult specimens obtained from the small intestine of a white-breasted sea eagle, *Haliæetres leucogaster* (Gmelin), caught in Pandacan, Manila.

Body small, 0.36 to 0.45 by 0.16 to 0.23 millimeter, oblong in normal state of distention (pear-shaped when flattened), with a ventrally concave anterior portion and an enlarged (almost globular) posterior one, all the reproductive organs confined in the latter region. Cuticle beset with minute scalelike spines thickly set anteriorly, gradually fading out towards the distal fifth of the body. Oral sucker subterminal, 0.03 to 0.04 by 0.04 to 0.05 millimeter, ornamented with a single circlet of 8 to 14 delicate spines; pharynx longitudinally oval, 0.017 to 0.035 by 0.017 to 0.024 millimeter; œsophagus long, 0.035 to 0.080 by 0.011 to 0.014 millimeter; intestinal cæca simple, as large as the œsophagus in diameter, terminating blindly shortly in front of the testes.

Female reproductive organs.—Ovary transversely oval, 0.049 to 0.067 by 0.042 to 0.046 millimeter, on the right side of the median line, in front of right testis. Receptaculum seminis spherical to transversely oval, 0.045 by 0.035 millimeter to the left of the ovary, median or slightly to the left of the median line, in front of left testis. Uterus long, thrown into coils between testes and ventrogenital sac. Vitellaria consist of two rows of glands, each having from 7 to 8 coarse follicles disposed of more or less longitudinally between the corresponding testis and the posterolateral border of the body.

Male reproductive organs.—Testes transversely oval, 0.070 to 0.081 by 0.046 to 0.049 millimeter, lying side by side near distal end of body. Seminal vesicle well developed, divided by a constriction into two portions, situated one behind the other between the ventrogenital sac in front and the ovary and receptaculum seminis behind. Ventrogenital sac more or less median, occupied mostly by a globular ventral sucker, 0.045 to 0.052 millimeter in diameter. Lenticular-shaped body (gonotyl) protrusible, usually in the left anterolateral angle of the sac, about twice as big (0.098 millimeter) as the ventral sucker, adorned with two curved rows (one near each opposite border of gonotyl) of closely set, bluntly pointed chitinous bars, 11 to 12 in each row; each bar measuring 7 to 11 by 4 to 6 microns. Excretory bladder T-shaped. Eggs oval, brown, thin-shelled, 21 to 25 by 7 to 11 microns.

Specific diagnosis—Pygidiopsis: Body pear-shaped, small, 0.36 to 0.45 by 0.16 to 0.23 millimeter, oral sucker with a single circlet of 8 to 14 delicate spines; intestinal cæca simple, terminating blindly in front of testes; ovary transversely oval, on right side of median line, in front of right testis; receptaculum seminis spherical to transversely oval, median or immediately in front of left testis; uterine coils between testes and ventrogenital sac; testes transversely oval, lying side by side near distal end of body; ventrogenital sac with ventral sucker more prominent; lenticular-shaped body about twice as big as ventral sucker, having a double row of coarse, closely set, bluntly pointed chitinous bars each measuring 7 to 11 by 4 to 6 microns. Excretory bladder T-shaped. Eggs small, 21 to 25 by 7 to 11 microns.

Host.—*Haliæetres leucogaster* (Gmelin).

Location.—Small intestine.

Locality.—Pandacan, Manila.

Type specimen.—Parasitological collection, Department of Parasitology, School of Hygiene and Public Health, University of the Philippines.

Remarks.—When Looss (1907) erected the genus *Pygidiopsis*, it had only a single species; namely, *Pygidiopsis genata* Looss, 1907. The present material, if considered valid, represents the second species, and differs from *genata* mainly in the size and pattern of the gonotyl. According to Witenberg (1929), the ventral sucker of *P. genata* has the same dimension (0.04 to 0.06 millimeter) as the long axis of the gonotyl. In our specimen the long axis of the latter organ is about twice as long (0.09 millimeter) as the diameter (0.04 to 0.05 millimeter) of the ventral sucker. Unfortunately, however, the descriptions by Looss (1907), Ransom (1920), Linton (1928), Witenberg (1929), and Ciurea (1933) of the structure of the gonotyl of *P. genata* are either too incomplete or too misleading to enable us to establish a more accurate differentiation from the same organ of our material. For instance, *Ascocotyle plana* Linton, which was absorbed into the genus *Pygidiopsis* by Witenberg (1929) as a synonym of *P. genata* following his revision of the trematode family Heterophyidæ Odhner, was first described by Linton (1928) as possessing a "cirrus-pouch," an organ which is altogether absent among the heterophyid flukes. Ciurea (1933), on the other hand, opines that folds having the appearance of tiny rodlets disposed radially and formed by the cuticle, line the degenerated genital sucker which is found in the interior of the sinus.[1] But Witenberg (1929), although failing to define thoroughly this organ, seems to show in his text figure certain characters that may be of value in differentiating our material. According to his illustration on page 186, the gonotyl bears chitinous bars, which are fine, few in number, set far apart, and found at the border;[2] the chitinous bars in our specimen are coarse, more in number (11 to 12 bars in each row), closely set with their ends bluntly pointed, and situated on the surface, suggestive of the gonotyl of *Haplorchis taichui* Nishigori, 1924. Owing to the variability of opinions, the senior author finally communicated with Professor Faust, who kindly lent him from his collection three specimens of *P. genata* obtained from a dog in Canton, China. A careful study of the three specimens revealed a conspicuous lenticular-shaped gonotyl, minus the chitinous rodlets.

The form of the ovary and the extent of the intestinal cæca also serve to differentiate our species from *P. genata*. In *P. genata* the ovary is globular and the intestinal cæca reach only the level of the ovary. In our specimen the ovary is transversely oval and the intestinal cæca reach as far as the anterior border of the testes.

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[1] A l'interieur du sinus, on trouve une ventouse génitale dégradée, tapissée par une cuticule qui forme des plis ayant l'apparence des petits bâtonnets, disposés d'une manière radiaire.

[2] When this paper was in press, 5 specimens of *P. genata* were sent to us from Palestine by Professor Witenberg. Careful examination of these specimens revealed that the position of the chitinous bars is true to his illustration.

ACKNOWLEDGMENT

We are greatly indebted to Prof. Ernest C. Faust, of Tulane University, and Prof. G. Witenberg, of the Hebrew University, for lending us some of their specimens for comparison, and to Dr. Candido M. Africa, Head of the Department of Parasitology, School of Hygiene and Public Health, University of the Philippines, for his kindness in going over this paper.

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ILLUSTRATION

[Drawn by H. T. Cable.]

[Abbreviations: *exb*, excretory bladder; *int*, intestinal caeca; *lb*, lenticular-shaped body (gonotyl); *es*, esophagus; *os*, oral sucker; *ov*, ovary; *ph*, pharynx; *rs*, receptaculum seminis; *sv*, seminal vesicle; *t*, testis; *vg*, vitelline gland; *vgs*, ventrogenital sac.]

PLATE 1

FIG. 1. *Pygidiopsis marivillai* sp. nov., ventral view.

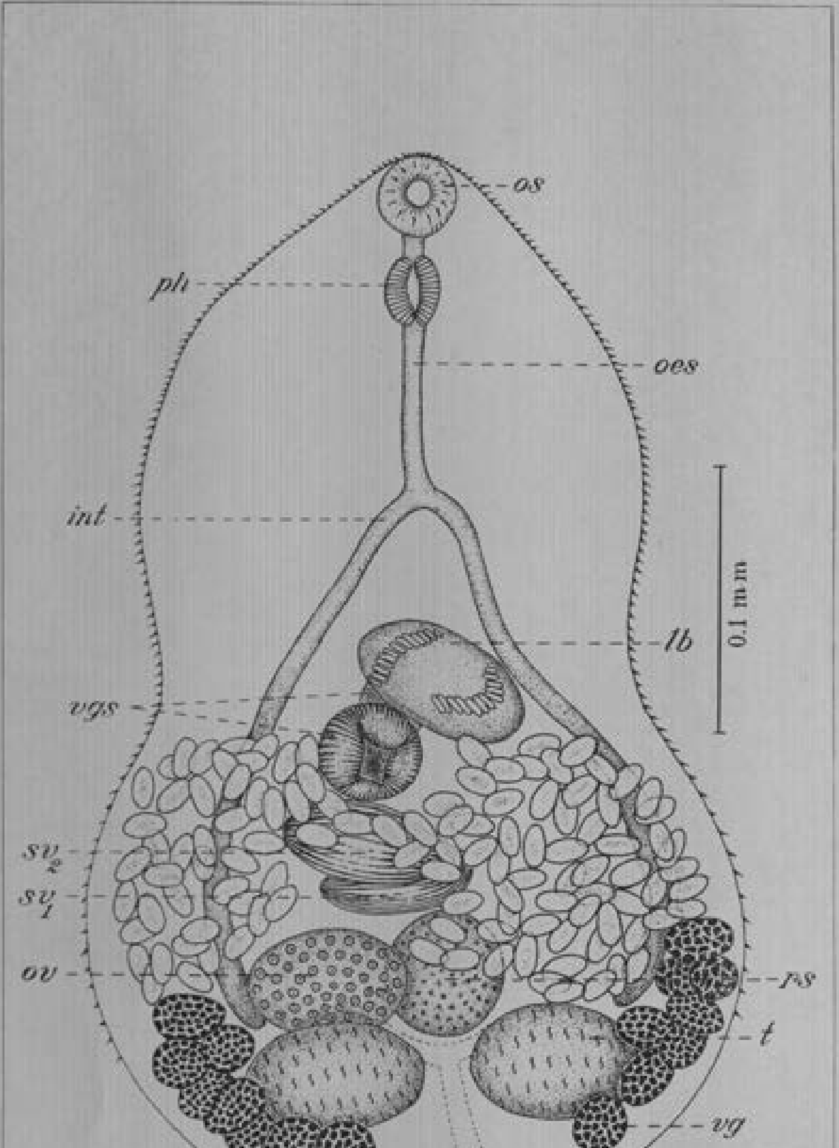

PLATE 1.

A MODIFIED PERMANGANATE METHOD FOR THE DETERMINATION OF ANTIMONY IN COMMERCIAL LEAD AND HIGH-LEAD ALLOYS

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Chemist, United States Navy Yard, Cavite, Philippine Islands

The analysis of commercial lead or high-lead alloys for antimony is usually quite laborious and time consuming. The standard method of the American Society for Testing Materials requires large initial weights of the metal or alloy for analysis and involves the sulphide separation. Considerable experience is also required to carry out the method properly, because of the difficult procedures. Finally the antimony cannot be determined directly since it must be separated from the other metals present.

The distillation method first used by Fischer(1) for arsenic, and later extended to antimony and tin by other investigators [Plato,(2) Hartman,(3) Järvinen,(4) Biltz(5) and Sherrer(6)] has the attractive feature of being generally applicable to a wide range of ores and alloys containing antimony. This method requires an all-glass distilling apparatus which may not be always available in some laboratories.

The standard permanganate method for the determination of antimony is free from the sulphide objection and does not require a glass apparatus. Concerning the accuracy of this method Hillebrand and Lundell(7) state: "In the opinion of one of us (L) the most accurate determination of antimony, when its amount exceeds a few milligrams, is that in which the element is oxidized to the quinquevalent state in sulphuric-hydrochloric acid solution by means of a standard solution of permanganate." Besides the accuracy of this method it has the additional advantage that any tin present can be determined by the iodometric method in the residual solution from the antimony.

The procedure for the permanganate method is as follows: 1 gram of the metal or alloy is placed in a 500 cc Erlenmeyer flask and treated with 15 cc of concentrated sulphuric acid and 5 grams of potassium bisulphate. The flask is covered with a small watch glass and its contents allowed to digest on a hot plate for one or two hours. The residue, after cooling, is mixed with 50 cc of 10 per cent tartaric acid and 10 cc of concentrated hydrochloric acid. The mixture is heated until it boils, and allowed to continue boiling for about a minute to eliminate sulphur dioxide. Then 125 cc of cold water is added, followed by 10 cc of concentrated hydrochloric acid. The mixture is cooled in ice to at least 10° C., and titrated with 0.1 *N* potassium permanganate to a slight pink shade that persists for about 10 seconds. This is essentially the method of Treadwell and Hall,(5) but slight changes have been made in the manner of dissolving the metal or alloy and also in the volumes of sulphuric and hydrochloric acids used. Hillebrand and Lundell limited their description of the method essentially to pointing out that the hydrochloric acid should be not less than 10 or greater than 25 per cent. The quantity of sulphuric acid they limit to approximately 10 per cent by volume.

This method has the additional advantage of being susceptible to considerable variation in manipulation.

In the analysis of alloys containing large amounts of lead (80 to 99 per cent) the permanganate method is not so accurate, due to the accumulation of relatively large quantities of insoluble lead sulphate formed during the conversion of the metals into sulphates. The insoluble lead sulphate naturally carries down or occludes a considerable amount of antimonious sulphate. During the subsequent operations only a part of the occluded antimony dissolves, so that in the final titration with potassium permanganate the results are likely to be low.

In view of this difficulty an experimental study was made with the object of treating the lead sulphate in such a manner that the occluded antimony can be restored to the solution, in order to correct any error from that source and to assure an accurate titration with standard permanganate.

EXPERIMENTAL PROCEDURE

Several experiments were carried out according to the suggested procedure of Hillebrand and Lundell. The residues containing the sulphuric acid, potassium bisulphate, and lead sulphate were digested with various quantities of water and hydrochloric acid. In one very carefully conducted experiment approximately 0.90 to 0.95 gram moist lead sulphate was mixed with 15 cc of sulphuric acid and 5 grams of potassium bisulphate.

The mixture was boiled a minute or two, cooled, and 15 cc of water added. It was again cooled, 15 cc of hydrochloric acid added, and the mixture digested hot for about 15 minutes. There was no appreciable solution of the lead sulphate. The volumes of water and hydrochloric acid were then increased by 25 cc and 10 cc of the two respectively. The hot digestion was repeated but the bulk of the lead sulphate remained undissolved. Finally 25 cc of water and 25 cc of hydrochloric acid were added and the hot digestion continued for about 15 minutes. At least a third of the lead sulphate remained undissolved. The percentage of hydrochloric acid in the final mixture would have been approximately 25 per cent, had the solution been diluted before titration, as in the permanganate method.

Duplicate determinations of antimony were next made in a sample of impure lead containing 94.43 and 5.45 per cent of lead and antimony respectively. The agreement of the duplicates was not good and the error ranged from 8 to 10 per cent. Evidently a portion of the antimony was still occluded in the lead sulphate.

Recently Robinson(9) developed a method for the determination of antimony in lead-rich alloys. He used no tartaric acid and appeared to depend entirely on the hydrochloric and sulphuric acids to dissolve the lead sulphate and to obtain the antimony in soluble form.

Determinations of antimony were made according to this method in two lead-rich mixtures. The first contained 0.9950 gram lead and 0.0050 gram antimony and the second 0.8950 gram lead, 0.0050 gram antimony, and 0.1000 gram tin. It was found that the lead sulphate was only partially dissolved and it was quite impossible to obtain any certain end points on account of the rapid fading-out effects.

It is well known that lead sulphate dissolves readily in a concentrated solution of ammonium acetate. It seemed quite probable that this salt might be used successfully to obtain all, or nearly all, of the antimony in titratable form.

Accordingly there were performed a number of experiments in which saturated ammonium acetate solution was used to dissolve the lead sulphate. In several analyses of metal mixtures containing 90 to 98 per cent of lead it was found that this change in the general procedure gave fairly good results. The average error in these preliminary experiments was usually about —3 per cent.

The permanganate method as modified and improved by the used of ammonium acetate is as follows:

MODIFIED PERMANGANATE METHOD

One gram of impure lead, or lead-rich alloy, is mixed with 15 cc of concentrated sulphuric acid and 5 grams of potassium bisulphate in a 500-cc Pyrex flask and allowed to digest on a hot plate overnight. The contents of the flask are then shaken and boiled for 10 to 12 seconds over a Bunsen flame. The insoluble sulphates should have no dark color. The flask and contents are allowed to cool and 15 cc of cold water are added slowly. The flask is then placed in an inclined position and the lead and other insoluble sulphates allowed to settle out rapidly. The transparent, or nearly transparent, liquid is then carefully decanted into a second *Erlenmeyer* flask, and the residual insoluble sulphates washed consecutively with two 25 cc portions of 10 per cent tartaric acid solution; the separate washings are decanted as before into the second flask, to which is added 10 cc of concentrated hydrochloric acid.

The washed and insoluble lead and other sulphates are then treated with 40 cc of 33 per cent ammonium acetate solution (Merck reagent), and digested, near the boiling point, on a hot plate until the insoluble sulphates completely dissolve. To obtain the proper volume 30 cc of water are now added and the solution set aside.

The washings in the second Erlenmeyer flask are then heated to the boiling point and the boiling continued for at least one minute. To the boiling solution 10 cc of hydrochloric acid are added, after which the contents of the first flask (the ammonium acetate solution of the lead and other insoluble sulphates) are rapidly added. The ammonium acetate flask is then washed with 40 cc of cold water. When this wash water is poured into the second flask it causes a portion of the lead sulphate to again precipitate. The final solution thus prepared is placed in ice and cooled to 5° or 8° C. It is then titrated in the usual manner with standard 0.1 *N* potassium permanganate. The end point should persist for 8 to 10 seconds and is usually easy to recognize.

Two acid burettes were used for the titrations. One was a 50-cc burette graduated at 27.5° C., and calibrated for measurements at 30° C. The other was a 10-cc microburette, which was also graduated at 27.5° C. It had been inspected and stamped in Berlin at the Physikalisch-Technische Reichsanstalt and could be read to 0.01 cc.

All titrations were carried out slowly and the readings were always made after the level of the solution in the burette was constant. A time interval of about 45 seconds was usually allowed for this adjustment.

The 0.1 *N* potassium permanganate was carefully standardized against 0.1500 gram of antimony and 0.1500 gram of tin under the same conditions as those employed in the modified method of analysis.

Six blank titrations were made according to the procedure above. The average value for the blank was 0.060 cc of the standard 0.1 *N* potassium-permanganate solution.

In Tables 1 and 2 are given the results of twenty-two analyses, made according to the modified permanganate method. Table 1 contains the analyses of various mixtures of lead and antimony, and analyses of mixtures containing lead, antimony, and tin are given in Table 2. The metals used for the analyses shown in Tables 1 and 2 and for the permanganate standardization above were Baker's C. P., analyzed.

TABLE 1.—*Analysis of mixtures of lead and antimony by the modified permanganate method.*

Sample.	Mixture.				Antimony.	
	Lead.		Antimony.		Found.	Error
	g.	Per cent.	g.	Per cent.	g	Per cent.
1	0.9990	99.90	0.0010	0.10	0.00120	19.60
2	0.9980	99.80	0.0020	0.20	0.00192	— 4.10
3	0.9950	99.50	0.0050	0.50	0.00510	+ 2.00
4	0.9920	99.20	0.0080	0.80	0.00780	— 2.40
5	0.9500	95.00	0.0500	5.00	0.04908	— 1.80
6	1.9400	97.03	0.0600	2.97	0.05929	— 1.10
7	0.9400	94.00	0.0600	6.00	0.06035	+ 0.70
8	0.9000	90.00	0.1000	10.00	0.10068	+ 0.68

TABLE 2.—*Analysis of mixtures of lead, tin, and antimony by the modified permanganate method.*

Sample.	Mixture.						Antimony	
	Lead.		Tin.		Antimony		Found.	Error.
	g.	*Per cent.*	*g.*	*Per cent.*	*g*	*Per cent.*	*g*	*Per cent.*
1	0.9960	99.60	0.0014	0.14	0.00016	0.016	0.00035	+100.0
2	0.9985	99.85	0.0010	0.10	0.00050	0.050	0.00034	−22.6
3	0.9891	98.91	0.0099	0.99	0.00102	0.102	0.00116	+13.6
4	0.9870	98.70	0.0111	1.11	0.00200	0.200	0.00198	−1.2
5	0.9895	98.95	0.0085	0.85	0.00200	0.200	0.00197	−1.5
6	0.9950	99.50	0.0010	0.10	0.00500	0.500	0.00496	−0.8
7	0.9121	91.21	0.0799	7.99	0.00800	0.800	0.00805	+0.62
8	0.8000	80.00	0.1900	19.00	0.01000	1.000	0.00992	−0.80
9	0.9000	90.00	0.0900	9.00	0.01000	1.000	0.00997	−0.30
10	0.8850	88.50	0.1000	10.00	0.01500	1.500	0.01481	−1.29
11	0.9396	93.96	0.0104	1.04	0.05000	5.000	0.04920	−1.60
12	0.9094	90.94	0.0406	4.06	0.05000	5.000	0.04925	−1.50
13	0.9000	90.00	0.0100	1.00	0.09000	9.000	0.09032	+0.35
14	0.8000	80.00	0.0100	1.00	0.19000	19.000	0.19048	+0.25

SUMMARY

Analyses of lead-antimony and of lead-tin-antimony mixtures were made by the permanganate method as modified by the use of ammonium acetate.

The modified method is easily carried out and amounts of antimony from 0.20 to 19.00 per cent in high lead alloys can be successfully determined with an accuracy ranging from about 0.30 to 2.0 per cent.

The presence of tin up to 19 per cent exerts no objectionable influence on the accurate determination of the antimony in high lead alloys.

When less than 0.2 per cent of antimony is present the accuracy is greatly reduced and the modified permanganate method becomes impractical for such amounts, as shown in samples 1 (Table 1) and 1, 2, and 3 (Table 2).

The use of hydrochloric acid as a means of rendering the lead sulphate soluble and thus obtaining the occluded antimony in titratable form was found to be undesirable for the high-lead antimony and tin mixtures investigated.

Compared to the distillation method and also to the standard method, the modified permanganate method is much more direct, less laborious, and should not require more than 90 minutes after the metals have been converted to sulphates.

A microburette graduated to 0.01 cc is very necessary for the accurate analysis of lead samples that have an antimony content of 0.20 to 6 per cent.

The residue from the antimony analysis can be used conveniently for the determination of tin by the volumetric method.

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THE OXYBELINE WASPS OF THE PHILIPPINES, WITH A SYNONYMIC CATALOGUE OF THE ORIENTAL SPECIES (HYMENOPTERA: SPHECIDÆ)

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ONE PLATE

The oxybeline wasps of the Philippines have attracted little attention hitherto, and save for a very inaccurate and incomplete description of a species by Ashmead, nothing has been published on the group from this region. The present paper is based upon the large Philippine collection, now in the United States National Museum, formed by the late Charles Fuller Baker, of the College of Agriculture (Philippines), and smaller ones made by Dr. Francis X. Williams, of the Hawaiian Sugar Planters' Association, and the late R. C. McGregor, of the Philippine Bureau of Science. Further collecting in the interior of the islands and in northern Luzon, regions from which material is still lacking, will probably result in the addition of new forms to the Philippine fauna. Until such material is forthcoming, the keys presented in this paper will serve to place all forms known at present to occur in this region.

The Philippines and Wallacea[1] in general have a very poor representation of oxybelines, in comparison with the other regions of the world, with the exception of Australia and the Polynesian region. Only eight forms[2] are known from this area, and all of these belong to the wide-ranging genus *Oxybelus*. *Belomicrus* and *Belomicroides* are still unknown from the Philippines, or for that matter from Wallacea and the adjacent Malayan region. These genera, however, are more ancient types than *Oxybelus*. They are largely Holarctic and Æthiopian in distribution, and in these regions are, in the main, confined to definitely more xeric areas than *Oxybelus*; consequently, it is hardly likely that they will be found in Wallacea, which has in large part an extremely heavy rainfall. I have seen no material of this group in general from northern Luzon, so that it is barely possible that in the drier portions of northern and western Luzon there may eventually be found a relic form that is the survivor of some early faunal invasion.

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[1] See Dickerson et al.: Distribution of Life in the Philippines, Monographs of Bureau of Science, Manila, No. 21, for a definition and discussion of this region.

[2] Including *Oxybelus agilis* Smith, recorded from Celebes.

The pauperitic character of the oxybeline fauna in the Philippines and in Wallacea in general is due to the fact that the group is ectogenic to the Oriental region. It is entirely absent from the Australian region, and but one species [3] is as yet known from the Polynesian region. Such species as now occur in the Orient are representatives of, or developments from, relatively recent colonizations from the Palæartic region. The oxybeline population of Wallacea and the Malayan region to the west of it are relatively recent invasions from the Indian region, although in the case of Malaysia there has been a noticeable influx from China. The forms now occurring in Wallacea are representatives of the *agile* and the *lamellatum* groups. The former is widely distributed throughout the Orient, while the latter is widespread over the Oriental, Æthiopian, and Mediterranean regions. The *agile* group is represented in the Philippines by *Oxybelus sulunense* and *O. xanthogaster*, and is confined entirely to the Bornean province, whereas the *lamellatum* group,[4] a more highly developed assemblage in many respects than the former, is restricted almost exclusively to the Philippine provinces, where certain species such as *Oxybelus banksi* and *O. philippinense* are widely distributed throughout the islands.

As yet nothing is known concerning the ethology of the Philippine oxybelines; but, as in other regions of the world, they in all probability provision their nests with flies, particularly such common domiciliary or semidomiciliary pests as the house fly, the blue bottle, the stable fly, and many others of more or less economic importance. Fletcher [5] states that at Coimbatore and Guindy, in southern India, *Oxybelus lamellatum* Olivier [6] is a very efficient and useful check on *Musca crassirostris* Stein,[7] a common blood-sucking fly of cattle of that region. Both Laveran[8] and Piccard[9] have recorded *Oxybelus rufipes* Taschenberg preying upon tsetse flies in considerable numbers in tropical Africa, while recently Bequaert[10] has called attention to the fact that in Guatemala *Oxybelus pyrura* (Rohwer), known by the natives as "policias," is a very efficient enemy of adult *Simulium* and preys commonly there upon the three species[11] that are the vectors of onchocerciasis. The species of this genus, therefore, fill a useful niche, however small it may be, in the natural control of many noxious pests, and more data are greatly to be desired concerning the habits and prey of the tropical species.

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[3] *Oxybelus vturose* Cheesman, described from Raiatea in the Society Islands.

[4] This is the group to which Dahlbom's name *Notoglossa* is applicable. Many authors have considered it a discrete genus, incorrectly placing therein all the species of *Oxybelus* that have the apex of the mucro excised. *Notoglossa*, however, is at most but a species group and is confined entirely to the Old World.

[5] Some South Indian Insects (1914) 280.

[6] Recorded as *Oxybelus squamosus* Smith, 1875, a synonym of *O. lamellatum* Olivier, 1811.

Key to the genera of Oxybelinæ.

1. Postscutellum simple, not provided laterally with squamæ; propodeum simple, not furnished with a median dorsal process—the mucro; last abdominal sternite of the female strongly compressed and provided with a high median longitudinal lamelliform carina; abdomen of the male with transverse villous grooves near bases of third and fourth tergites; psammophore present, well developed in the female, vestigial or rudimentary in the male. Æthiopian and Mediterranean forms. *Belomicroides* Kohl.

Postscutellum armed laterally with squamæ, or at least with alate lateral expansions; propodeum (except in *Anoxybelus* Kohl) with a mucro; abdomen not as above.. 2.

2. Abdominal tergites 1 to 5 (and 6 in males) abruptly flexed under at sides so that ventral and dorsal portions of tergites form a sharp edge at their junction; sternites flat; appendiculate cell of forewing, if present, very small, so that marginal cell appears lanceolate or acute at apex; last tarsal joint not swollen; female with a psammophore. Widespread .... *Belomicrus* A. Costa.

   a. Flagellum of antennæ short, all joints, except first, second, and last as wide as or wider than long; mandibles edentate internally or with only a dentiform angle medially.. *b.*

   Flagellum long, first six and apical joints longer than wide, remainder as long as wide; mandibles with a very large tooth internally near base, outer margin dilated above at about middle, basal third arcuately excised. South African forms. *Belomicrus* (*Nototis*) Arnold.

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[7] Recorded as *Philæmatomyia insignis* Austen, a synonym of *Musca crassirostris* Stein.

[8] Comp. rend. Acad. Sci. 144 (1907) 536–551.

[9] Comp. rend. Mem. Soc. Biol. 61 (2) (1909) 360–362.

[10] Contrib. Dept. Trop. Med. & Inst. Trop. Biol. & Med. Harvard (6) (1934) 201–202.

[11] *Simulium metallicum* (Dyar et Shannon), *S. callidum* Bellardi, and *S. ochraceum* Walker.

b. Mandibles excised on their outer margin.
Belomicrus (*Oxybelomorpha*) Brauns.[13]

Mandibles entire, not excised beneath.
Belomicrus (*Belomicrus*) A. Costa.

Tergites not sharply fixed under at sides, sharp edge not present save on first two tergites; sternites convex; females without a distinct psammophore .... 3.

3. Last tarsal segment not swollen; appendiculate cell of forewing, if present, very small so that marginal cell appears lanceolate or acute at apex; postscutellar squamæ poorly developed, merely alate lateral expansions of postscutellum; no distinct tarsal comb present. South African forms .... *Brimocelus* Arnold.

Last tarsal segment swollen; appendiculate cell of forewing distinct and wide so that marginal cell appears more or less truncate apically; squamæ always distinct and well developed; tarsal comb present and well developed; at least in the female .... 4.

4. Mesepisternum with a precoxal carina; scutellum and postscutellum longitudinally carinate medially; puncturation of body usually coarse. Widespread .... *Oxybelus* Latreille.[14]

Mesepisternum without a precoxal carina; scutellum and postscutellum not longitudinally carinate medially; puncturation of body finer. Nearctic forms .... *Enchemicrum* Pate.

Genus OXYBELUS Latreille[15]

Key to the Philippine species.

1. Males .... 2.

Females .... 5.

2. Mucro narrow, canaliculate above, sides subparallel, apex retuse (Plate 1, fig. 1); lateral abdominal spines absent .... *bakerense* sp. nov.

Mucro subfoliaceous, apex excised, with a median longitudinal carina; lateral abdominal spines present .... 3.

3. Mesonotum with large punctures evenly distributed throughout, not depressed but flat or convex discally between parapsides.
æquipunctatum sp. nov.

Mesonotum coarsely and confluently punctured, rugose posteriorly, depressed and more or less excavate discally between parapsides .... 4.

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[13] Gussakovsky recently proposed *Pseudoxybelus* [Trav. Inst. Zool. Acad. Sci. URSS 1 (1933) 260] as a subgenus of *Belomicrus* for the reception of *B. persa* Guss. from Kirman, Persia. *Pseudoxybelus*, however, may at most be regarded as but a species-group of the subgenus *Oxybelomorpha* Brauns.

[14] Including *Anoxybelus*, which Kohl proposed as a subgenus [Konowia 2 (1923) 274] of *Oxybelus* for the reception of *O. maidlii* Kohl from Aba in Baluchistan. I have not seen any material of this species, still known only from the unique female type in the British Museum. Insofar as I can gather from Kohl's description, *Anoxybelus* differs from the typical *Oxybela* only in lacking a mucro.

[15] The gender of *Oxybelus* has hitherto been regarded as masculine, but a study of its etymology at once reveals that it is neuter.

4. Mucro traversed from base to apex of excision by a very strong median longitudinal carina whence diverge on each side a number of transverse oblique carinulæ (Plate 1, fig. 2) .... *banksi* (Ashmead).
   Mucro with a weak median longitudinal carina forking about half way and sending a weak oblique carina toward each tip of mucro (Plate 1, fig. 3) .... *banksi* forma *divaricatum* fo. nov.

5. Mucro narrow, canaliculate above, sides subparallel, apex retuse or emarginate (Plate 1, figs. 4 and 6) .... 6.
   Mucro foliaceous, excised at apex and with numerous longitudinal and oblique carinulæ (Plate 1, fig. 11) .... 7.

6. Clypeal bevel sharply and obtusely angulate medially (Plate 1, fig. 7); temporal carinæ obsolete below; first two abdominal tergites at most with large yellow maculæ laterally .... *suluense* sp. nov.
   Clypeal bevel rounded out medially (Plate 1, fig. 9); temporal carinæ present below; abdominal tergites 2 to 5 entirely yellow above.
   xanthogaster sp. nov.

7. Median fovea of propodeum shining, impunctate within.
   philippinense sp. nov.
   Median fovea of propodeum dull, reticulate within.
   philippinense forma *reticulatum* fo. nov.

OXYBELUS SULUENSE sp. nov. Plate 1, figs. 1, 4, 7, and 8.

Male.—Length 4.5 millimeters. Black; mandibles yellow, apices dark red; pronotum to and including tubercles, spot on tegulæ, a large spot on each side of scutellum, squamæ internally, middle third of mucro, apical half of fore and middle femora beneath, hind femora apically above, fore and middle tibiæ externally, hind tibiæ basally, yellow. First abdominal tergite with large, well separated yellow spots laterally; second, third, and fourth tergites with traces of linear maculations laterally. Tegulæ, squamæ, and apical third of mucro, whitish subhyaline. Wings clear hyaline, veins dark brown. Front and clypeus with silvery pubescence, somewhat appressed; thorax and abdomen with thin, scattered silvery pubescence.

Head with small close punctures; vertex and temples striate-punctate; clypeus strongly carinate medially, anterior margin sharply tridentate, median tooth rostrate, formed by projecting end of discal carina (Plate 1, fig. 8); temporal carina present above, obsolete or obsolescent below.

Thorax with puncturation similar to head; anterior margin of pronotum transversely carinate to and including tubercles which are subdentate laterally. Mesonotum with a median longitudinal stria on anterior third, and a carina on posterior sixth. Scutellum and postscutellum longitudinally carinate medially, punctured like the mesonotum. Squamæ subrectangular, internally with a blunt tooth that barely surpasses incurved, acute, depressed apices (Plate 1, fig. 1). Prepectus and mesosternum sharply margined anteriorly; episternal suture foveolate; prepectus and pleura rugose. Mucro narrow, straight, canaliculate above, sides subparallel, apex retuse (Plate 1, fig. 1). Propodeum with oblique rugæ and reticulations dorsally; median fovea subrectangular, ventrally with an acute angle passing into a median carina as long as fovea which is polished and impunctate within and incompletely closed above; lateral areas shining, with a few fine, scattered punctures and transverse rugæ; lateral faces shining, with a few longitudinal striæ.

Abdomen shining, with fine, well separated punctures, preapical color-ridges moderately developed; lateral abdominal spines wanting; pygidium rectangular, wider than long; sternites polished, with a few fine, scattered punctures.

Female.—Length 5 millimeters. Differs from male as follows: Maculations of scutellum and abdomen larger. Mucro emarginate apically (Plate 1, fig. 4), and with basal two-thirds and adjacent region of propodeum yellow. Clypeus (Plate 1, fig. 7) tuberculate discally, subbevelate, polished and impunctate apically where it is quadrisinuate and thus tridentate, apical margin acutely pointed medially. Temporal carina weak, obsolete below.

Holotype.—Male, BORNEO, Sandakan (*Baker*), United States National Museum, catalogue No. 42747.

Allotype.—BORNEO, 1 female, Sandakan (*Baker*), United States National Museum, catalogue No. 42747.

Paratypes.—BORNEO, 2 males, Sandakan (*Baker*), United States National Museum. PALAWAN, 1 male, Puerto Princesa (*Baker*), United States National Museum.

This species, a member of the *agile* group, is closely related to *O. agile* Smith, from which it may, however, be readily differentiated by the structure of the mucro and the squamæ and by the somewhat different color pattern. It is confined entirely to Borneo, like the following species.

OXYBELUS XANTHOGASTER sp. nov. Plate 1, figs. [illegible] and [illegible].

Male.—Unknown.

Female.—Length, 5 millimeters. Black; mandibles yellow, apices dark red; pronotum to and including tubercles, a spot on each side of scutellum, postscutellum laterally and posteriorly, and inner margins of the squamæ, mucro basally and medially, posterior half of the first abdominal tergite and all of second to fifth tergites, fore and middle femora apically beneath, all tibiæ basally above, whitish yellow. Fore tibiæ and all tarsi, fusco-ferrugineous; propodeum fuscous to fusco-piceous; antennæ fulvescent apically. Face and pleura with short, rather sparse, somewhat appressed pubescence; vertex and mesonotum with short, erect aëneous pubescence.

Head shining, with fine close puncturation; front with two shining, impunctate impressions to accommodate scapes when laid back; clypeus (Plate 1, fig. 9) sharply tuberculate discally just below antennal line, nitidous, subbevelate and quadrisinuate apically, evenly rounded out medio-apically; temporal carinæ present and well developed above and below.

Thorax with puncturation coarser than that of head. Pronotum transversely carinate anteriorly to and including tubercles which are subdentate laterally. Squamæ and mucro as in *suluense* save that the latter in this species is distinctly emarginate. Pleura coarsely punctate but not as strongly so as in *suluense*. Propodeum shining, with transverse oblique parallel carinulæ dorsally; median fovea broadly cuneate in outline, open above, shining within; lateral areas shining and with a few weak transverse somewhat irregular rugulæ; lateral faces nitidous, dorsally and posteriorly with a few fine rugulæ.

Abdomen cordate, subopaque to almost shining, with fine close puncturation on the tergites; sternites shining, polished, and with a few scattered punctures.

Holotype.—BORNEO, Lebang Hara, January 7, 1925[15] (*H. Winkler*), Zoologisches Museum, Hamburg, Germany.

This species, like the preceding one, belongs to the *agile* group. It is very close to *suluense* but the structure of the clypeus, the well-developed temporal carinæ, and the strikingly colored abdomen, stamp it as a discrete species. I am greatly indebted to Herr Wagner, of the Zoologisches Museum of Hamburg, for the opportunity of studying this interesting species.

OXYBELUS BANKSI (Ashmead). Plate 1, figs. 2 and 10.

Notoglossa banksi ASHMEAD, Proc. U. S. Nat. Mus. 28 (1905) 960; female.

Notoglossa banksi BROWN, Philip. Journ. Sci. 1 (1906) 686.

Male.—Length, 4.5 millimeters. Black; mandibles yellow, apices red; scapes and sometimes flagellum, prothoracic tubercles, squamæ internally, fore and middle femora apically beneath, all tibiæ externally, and tarsi, whitish yellow. First and second abdominal tergites with narrow elongate maculations laterally. Tegulæ and squamæ whitish subhyaline, margins and posterior third of mucro piceous subhyaline. Wings clear hyaline, veins dark brown. Front and clypeus clothed with silvery pubescence, somewhat appressed; thorax, abdomen, and legs sparsely clothed with silvery white hairs.

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[15] The date on the label of this specimen is given as "7.1.1925."

Head with small semiconfluent punctures which are larger and further apart just below ocelli; vertex very closely punctured; occiput and temples striate-punctate. Clypeus tridentate, median tooth strongly rostrate, apically with an inflexed nitidous impunctate bevel which is quinquedentate apically (Plate 1, fig. 10). Temporal carina well developed.

Thorax with anterior margin of pronotum transversely and sharply carinate, notched medially; mesonotum finely punctate anteriorly, coarsely punctate and rugose posteriorly, foveolate along posterior margin, depressed and more or less sulcate discally between parapsides, with a longitudinal stria anteriorly and a short low longitudinal carina mesoposteriorly. Scutellum coarsely punctate, with a median longitudinal carina; postscutellum finely punctate, with a median longitudinal cristate lamelloid carina. Squamæ subtrigonal, external margins raised, internally with an acute lobe that slightly surpasses incurved, acute, depressed apex. Prepectus and mesosternum sharply margined anteriorly; pleura coarsely punctate-striate. Mucro subfoliaceous (Plate 1, fig 2), lateral margins only slightly raised, as long as scutellum and postscutellum, widest at about basal third, thence very slightly narrowed toward apex which is angularly and deeply excised; traversed from base to apex of excision by a very strong longitudinal crista whence diverge on each side a number of transverse oblique carinulæ. Propodeum with oblique rugæ and reticulations dorsally; median fovea cuneate, shining and impunctate or occasionally finely granulose within, more or less closed above; lateral areas sparsely and very finely punctured, with a few transverse rugæ above, nonstriate below; lateral faces sparsely and very finely punctate, longitudinally striate.

Abdomen shining, punctures of the first two tergites coarser than those of succeeding tergites; preapical color-ridges present and well developed on tergites 1 to 4; 3 to 6 with small acute spines latero-apically on each side, 6 with a dorsolateral carinula on each side terminating posteriorly in a small spine; pygidium rectangular, longer than broad. Sternites shining, highly polished, sparsely punctate; second sternite finer and more closely punctate laterally.

Female.—Unknown.

Holotype.—Male, LUZON, Manila (*Charles S. Banks*), United States National Museum, catalogue No. 8201.

LUZON, Manila, 4 males, October, 1918 (*R. C. McGregor*), Cornell University; 2 males, no date (*Robert Brown*), United States National Museum: Laguna Province, Mount Maquiling, 2 males, no date (*Baker*), United States National Museum; Los Baños, 1 male, July 16 (*Frederick Muir*), Williams collection; 2 males, no date (*Baker*), United States National Museum. MINDORO, 1 male, December, 1921 (*F. X. Williams*), Williams collection. SIBUYAN, 2 males, no date (*Baker*), United States National Museum. SAMAR, 8 males, no date (*Baker*), United States National Museum. LEYTE, Tacloban, 3 males, no date (*Baker*), United States National Museum. CEBU, Cebu, 2 males, April, 1917 (*F. X. Williams*), Williams collection. NEGROS, Occidental Negros Province, 1 male, April, 1917 (*F. X. Williams*), Williams collection; Cuernos Mountains, 1 male, no date (*Baker*), United States National Museum. MINDANAO, Dapitan, 8 males, no date (*Baker*), United States National Museum; Davao, 1 male, no date (*Baker*), United States National Museum; Kolambugan, 25 males, no date (*Baker*), United States National Museum; Surigao, 1 male, no date (*Baker*), United States National Museum; Tangcolan, 1 male, no date (*Baker*), United States National Museum. PALAWAN, Puerto Princesa, 8 males, no date (*Baker*), United States National Museum.

Ashmead's description of this species is so inadequate and incorrect that it has been necessary to redescribe it. In his original description he states that the specimen he had before him was a female, but an examination of the type in the United States National Museum has revealed that it is a male. Ashmead furthermore states that *banksi* resembles *Notoglossa emarginata* (Say), but the latter belongs to an entirely different species-group from the former.

In the large series of specimens of *banksi* before me, there is considerable variation in the color pattern, ranging from relatively xanthic forms with the color distributed as noted in the foregoing description to melanistic specimens lacking any abdominal or thoracic maculations whatever. It might be possible to attribute these various color phases to seasonal and environmental factors, were there but full data available regarding the time, place, and conditions under which the material, particularly that collected by the late C. F. Baker, was taken. In addition to the variation in color, there is likewise a certain amount of variation in the sculpturing of the mucro and the puncturation and relative degree of sulcation of the mesonotum. However, these departures from the norm of the species are, as a rule, in no wise linked, but all conform in general to a common pattern.

OXYBELUS BANKSI forma DIVARICATUM fo. nov. Plate 1, fig. 3.

Male.—Length 4.5 millimeters. Differs from *banksi* as follows: Mucro (Plate 1, fig. 3) trigonal, sides more strongly divergent, apex excised, with a weak longitudinal carina forking about half way and sending a weak carina to each mucronal tip. Mesonotum rugose. Abdomen black, without maculations.

Female.—Unknown.

Holotype.—Male, MINDANAO, Kolambugan (*Baker*), United States National Museum, catalogue No. 42748.

This form has the general habitus of *banksi*, which likewise occurs at Kolambugan, as well as throughout the island of Mindanao. The mucro, however, as may be readily seen by consulting Plate 1, fig. 3, is quite distinct in shape and sculpturing from that of the typical *banksi*. It is quite possible that with the accession of more material *divaricatum* may be elevated to the rank of a discrete species. Until further material is forthcoming, however, it seems best at present to regard it as merely an atypical form.

OXYBELUS ÆQUIPUNCTATUM sp. nov. Plate 1, fig. 12.

Male.—Length, 5.5 millimeters. Black; mandibles yellow, apices dark red; scape dark brown, yellow apically, flagellum fulvescent apically. Pronotum to and including tubercles, a spot on tegulæ, squamæ internally, fore and middle femora apically beneath, fore, middle, and hind tibiæ and tarsi yellow; tarsi fulvescent apically. First abdominal tergite with narrow, linear, widely separated yellow maculations laterally; second, third, and fourth tergites with linear, widely separated yellow maculations laterally present only as a trace. Front and clypeus clothed with silvery pubescence; mesonotum with scattered fulvo-aëneous pubescence; pleura with short, scattered, whitish pubescence.

Head with front more closely punctate than *banksi*, puncturation uniform throughout; vertex and occiput very strongly and coarsely punctured; clypeus quite similar to *banksi*, with a strong median longitudinal carina discally, tridentate, the middle tooth strongly rostrate, apically with an inflexed nitidous bevel which is quinquedentate; temporal carinæ well developed throughout.

Thorax with the anterior margin of the pronotum sharply and transversely carinate, notched medially, laterally subdentate; mesonotum and scutellum nigro-aëneous, with large well-separated punctures throughout, their posterior margins foveolate; postscutellum medially with a longitudinal cristate lamelloid carina; squamæ subtrigonal, internally with an acute dentoid lobe that surpasses posteriorly the incurved, acute, depressed apex. Prepectus and mesosternum sharply margined anteriorly; pleura coarsely punctate. Mucro (Plate 1, fig. 12) subfoliaceous, the lateral margins only slightly raised, as long as scutellum and postscutellum, widest at about middle, thence subparallel to apex which is angularly and deeply excised, traversed from base to apex of excision by a very strong median longitudinal carina whence diverge on each side several transverse oblique carinulæ. Propodeum with oblique reticulations dorsally; median fovea trigonal, acuminate ventrally and passing there into a very short median carina, polished and impunctate within, open above; lateral areas finely and sparsely punctured, with a few irregular rugæ above; lateral faces shining, with fine scattered punctures between the longitudinal rugæ; lateral carinæ simple, not forked below.

Abdomen shining, rather coarsely punctate, preapical color-ridges present and well developed on first four tergites; third to sixth tergites with small acute spines latero-apically; pygidium rectangular, longer than broad; sternites shining, highly polished, and with a few scattered punctures.

Female.—Unknown.

Holotype.—Male, LUZON, Mount Maquiling (*Baker*), United States National Museum, catalogue No. 42749.

This species is very closely allied to *banksi* but may be readily distinguished from it by the evenly punctured and nonsulcate mesonotum.

OXYBELUS PHILIPPINENSE sp. nov. Plate 1, figs. 6 and 11.

Male.—Unknown.

Female.—Length, 6.25 millimeters. Black; mandibles yellow, apices red; scapes yellow with a dark-brown spot internally, flagellum fulvescent apically. Pronotum, tubercles, a spot laterally on each side of scutellum, postscutellum and squamæ internally, fore and middle femora apically beneath, fore tibiæ externally, and middle and hind tibiæ basally, yellow. Tarsi and fore tibiæ fulvous beneath. First four abdominal tergites laterally with transverse elongate maculations. Tegulæ and squamæ with outer margins subhyaline; margins of mucro piceous subhyaline. Head sparsely clothed with short silvery pubescence; mesonotum with short fulvo-aëneous hairs; pleura with short scattered whitish pubescence.

Head with small semiconfluent punctures which are larger and farther apart just below the ocelli; vertex coarsely punctured; occiput and temples finely striate-punctate; clypeus (Plate 1, fig. 5) tuberculate discally, subbevelate, shining and impunctate apically, rounded out medio-apically, obscurely bidentate laterally; temporal and occipital carinæ present and well developed.

Thorax with the anterior margin of pronotum sharply and transversely carinate, notched medially, subdentate laterally; mesonotum and scutellum shining, with large well-separated punctures, foveolate along their posterior margins; scutellum and postscutellum carinate longitudinally in middle, carina of latter lamelloid; squamæ short, subtrigonal, internally with an acute lobe which slightly surpasses the incurved, acute, depressed apices; prepectus and mesosternum sharply margined anteriorly; mesopleura shining, with large, well-separated punctures; metapleura longitudinally striate. Mucro (Plate 1, fig. 11) subovate, horizontal except at base, widest at about basal third, carinate longitudinally in middle with several subparallel to oblique carinulæ on each side, apex with an acute angular excision, apical teeth rounded. Propodeum with oblique rugæ and reticulations dorsally; median fovea cuneate, acuminate ventrally and passing thence into a short median carina, shining and impunctate within, open above; lateral areas shining, sparsely and very finely punctate; lateral carinæ simple, not forked below; lateral faces shining, sparsely and very finely punctate, finely longitudinally striate above.

Abdomen shining, with small well-separated punctures, those of the first two tergites coarser than those of following segments; preapical color-ridges present and well developed laterally on the first four tergites; pygidium trigonal, with short, coarse, appressed azureous hairs; sternites shining, highly polished, with a few distinct, scattered punctures basally, impunctate apically.

Holotype.—Female, LUZON, Los Baños, altitude 60 meters, November 12, 1932 (*Felix J. Madrid*).

Paratypes.—LUZON, Laguna Province, Los Baños, 2 females, no date (*Baker*), United States National Museum. MINDANAO, Kolambugan, 1 female, no date (*Baker*), United States National Museum; Dapitan, 1 female, no date (*Baker*), United States National Museum; Surigao, 1 female, no date (*Baker*), United States National Museum; Zamboanga, 1 female, September, 1921 (*F. X. Williams*), Williams collection. SAMAR, 2 females, no date (*Baker*), United States National Museum. BILIRAN, 1 female, no date (*Baker*), United States National Museum. NEGROS, Occidental Negros Province, 2 females, September, 1921 (*F. X. Williams*), Williams collection; Dumaguete, 1 female, April, 1917 (*F. X. Williams*), Williams collection. LEYTE, Tacloban, 1 female, no date (*Baker*), United States National Museum.

This species may eventually prove to be the female of *O. banksi*, but the great difference in the sculpturing of the thorax, particularly of the mesonotum, and in the character of the mucro and squamæ, have led me to regard it as discrete. Its thoracic structure approximates that of *O. æquipunctatum*, so that when fuller data are at hand, *philippinense* may prove to be the female of that form. *O. philippinense* is very interesting because its mucro exhibits a transition stage from the subfoliaceous type, such as is found in *O. banksi* (Ashmead), or in the New World *O. sparideum* (Cockerell) and the highly developed lamello-foliaceous type of the *O. lamellatum* subgenus for which Dahlbom erected the genus *Notoglossa*. Its affinities, however, are definitely with the latter rather than the former group. The livery of *philippinense* varies in a fashion comparable to, but not as greatly as, that of *banksi*.

OXYBELUS PHILIPPINENSE forma RETICULATUM fo. nov.

Female.—Length, 6 millimeters. Similar to *philippinense* but differing from it in having the median fovea of the propodeum dull and reticulate within, the maculations of the scutellum larger, and the postscutellum black medially.

Male.—Unknown.

Holotype.—Female, MINDANAO, Kolambugan (*Baker*), United States National Museum, catalogue No. 42750.

Paratype.—SAMAR ISLAND, female (*Baker*), United States National Museum.

In the series of specimens of *philippinense*, two were found which differed from the typical pattern of the species by the characters given above and which have led me to regard them as atypical forms that may be worthy of recognition. These may eventually prove to be merely aberrant individual specimens.

A SYNONYMIC CATALOGUE OF THE OXYBELINE WASPS OF THE ORIENTAL REGION

Since the appearance in 1897 of the eighth volume of Dalla Torre's Catalogus Hymenopterorum, no less than twenty-four Oriental species of *Oxybelus* and related genera have been described. With the accession of more material since the publication of the first volume of the Hymenoptera in the Fauna of British India and critical studies of typical specimens, it has been necessary to synonymize a number of species formerly considered valid. These data scattered throughout the literature of forty years have been brought together and are offered here in the form of a synonymical species catalogue so that they may be readily accessible to the students of the Oriental fauna. Further material from Siam, Burma, and the East Indies will unquestionably extend the known range of many of these forms and, in addition, undoubtedly lead to the discovery of new ones. It will indubitably result in making it necessary to consider as synonyms several of the species still considered valid.

As yet but one species of *Belomicrus* has been recorded from the Oriental region. *Belomicroides* has not yet been recorded from the Orient, while *Brimocelus* and *Euchemicrum* are still monotypic genera, the former known only from Rhodesia and the latter from the Austroriparian zone of the United States. In 1922 Kohl described *Oxybelus maidlii* for which, owing to the poor development of the squamæ and the absence of a mucro, he erected the subgenus *Anoxybelus* in the genus *Oxybelus*. I have followed Kohl in the catalogue below with regard to this species, having seen no authentic material of this species, which is still known only from the unique type in the British Museum. It may eventually prove to be either a *Brimocelus*, or more probably, a teratologic form of a species of *Oxybelus*, since forms of the latter are occasionally taken in which the mucro or squamæ or both are aborted or even entirely absent.

Genus BELOMICRUS A. Costa

Belomicrus A. Costa, Ann. Mus. Zool., Univ. Napoli 6 (1871) 80.

Oxybeloides Radoszkowski, Fedtschenko, Reise in Turkestan II, Sphegid. (1877) 68.

Oxybelomorpha Brauns, Kohl, Ann. k. k. Naturhist. Hofmus. Wien 11 (1896) 475.

Nototis Arnold, Ann. Transvaal Mus. 12 (1927) 64.

Pseudoxybelus Gussakovskij, Trav. Inst. Zool. Acad. Sci. URSS 1 (1933) 266.

Subgenus BELOMICRUS (sensu stricto)

BELOMICRUS (BELOMICRUS) MEYERI Kohl.

Belomicrus meyeri Kohl, Konowia 2 (1923) 200; male, Baluchistan, Quetta.

Genus OXYBELUS Latreille

Oxybelus Latreille,[16] Prec. Charact. Gen. Insect. (1796) 129.

Oxybelus Latreille, Hist. Nat. Crust. Insect. 3 (1802) 343.

Notoglossa Dahlbom,[17] Hymen. Europ. 1 (1845) 514.

Alepidaspis A. Costa,[18] Att. Rendic. Acad. Sci. Fis. Napoli 9 (1882) 35.

Alepidaspis A. Costa, Rendic. Acad. Sci. Fis. Napoli 21 (1882) 197.

Anoxybelus Kohl,[19] Konowia 2 (1923) 274.

Gonioxybelus Minkiewicz,[20] Polski Pismo Ent. 12 (1934) 251.

Orthoxybelus Minkiewicz, Polski Pismo Ent. 12 (1934) 251.

Subgenus ANOXYBELUS Kohl

OXYBELUS (ANOXYBELUS) MAIDLII Kohl.

Oxybelus (*Anoxybelus*) *Maidlii* Kohl, Konowia 2 (1923) 274, fig. 11; female, Baluchistan, Abu.

Subgenus OXYBELUS (sensu stricto)

OXYBELUS (OXYBELUS) ÆQUIPUNCTATUM sp. nov.

Male. Luzon.

OXYBELUS (OXYBELUS) ÆSTUOSUM Bingham.

Oxybelus æstuosus Bingham, Faun. Brit. Ind., Hymen. 1 (1897) 318; male, Lower Burma, Tenasserim.

OXYBELUS (OXYBELUS) AGILE Smith.

Oxybelus agilis Smith, Cat. Hymen. Brit. Mus. 4 (1856) 387; male.

Oxybelus sabulosus Smith, Cat. Hymen. Brit. Mus. 4 (1856) 388; female.

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[16] When Latreille defined the genus *Oxybelus* in 1796 he included no species. The first valid association of a species with this name was in 1802. [Mem. Amer. Ent. Soc. (9) (1937).]

[17] *Notoglossa* is at most but a species group, and is confined entirely to the Old World.

[18] Costa based his genus *Alepidaspis* on a teratological form of *Oxybelus lamellatum* Olivier, which he described as *Alepidaspis diphyllus*. The group is, in all probability, isogenotypic with *Notoglossa* Dahlbom, 1845.

[19] Retained provisionally as a subgenus of *Oxybelus* Latr.

[20] Minkiewicz proposed these names as subgenera of *Oxybelus*, basing them largely upon ethological characters, such as the type of nest constructed by the adult. As subgenera they are quite untenable, but they may be used for species groups. *Orthoxybelus*, however, is isogenotypic with *Oxybelus* Latreille.

Oxybelus agilis SMITH, Journ. Linn. Soc. 3 (1859) 18.
Oxybelus agilis SMITH, Proc. Linn. Soc. 7 (1863); Journ. Linn. Soc. 11 (1871) 363.
Oxybelus agilis CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 276.
Oxybelus subulosus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 276.
Oxybelus agilis BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 316; male.
Oxybelus subulosus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 316; female.
Oxybelus agilis DALLA TORRE, Cat. Hymen. 8 (1897) 638; male.
Oxybelus subulosus DALLA TORRE, Cat. Hymen. 8 (1897) 647; female.
Oxybelus agilis TURNER, Mem. Dept. Agr. India, Ent. Ser. 5 (1917) 190; male, female.

OXYBELUS (OXYBELUS) ARGENTEOLINEATUS Cameron = **CRABRO (LINDENIUS) ARGENTATUS** Lepeletier et Brullé, 1835.

Oxybelus argenteolineatus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 282.
Crabro (Lindenius) argentatus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 328.

OXYBELUS (OXYBELUS) AURIFRONS CAMERON, 1902, nec Smith, 1856 = **OXYBELUS (OXYBELUS) PICTISCUTIS** Cameron, q. v.

Oxybelus aurifrons CAMERON, Journ. Bombay Nat. Hist. Soc. 14 (1902) 287; male (*nec* Smith, 1856).
Oxybelus aurifrons AYYAR, Journ. Bombay Nat. Hist. Soc. 24 (1916) 550.
Oxybelus pictiscutis TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 190; male.

OXYBELUS (OXYBELUS) BANKSI (Ashmead) nom. nov.

Notoglossa banksi ASHMEAD, Proc. U. S. Nat. Mus. 28 (1905) 960; female.
Notoglossa banksi BROWN, Philip. Journ. Sci. 1 (1906) 686.

Male. Philippine Islands.

OXYBELUS (OXYBELUS) BANKSI fo. **DIVARICATUM** fo. nov.

Male. Mindanao.

OXYBELUS (OXYBELUS) BELLUS Cameron, 1890, nec Dahlbom, 1845 = **CRABRO BELLULUS** (Dalla Torre).

Oxybelus bellus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 280 [*nec* Dahlbom, 1845].
Crabro bellus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 325; male [*nec* Cresson, 1865].
Oxybelus bellulus DALLA TORRE, Cat. Hymen. 8 (1897) 638.
Crabro bellulus SCHULZ, Spol. Hymen. (1906) 210.

OXYBELUS (OXYBELUS) BICOLORISQUAMA Strand.

Oxybelus bicolorisquama STRAND, Internat. Ent. Ztschr. 16 (1922) 172; male.

Oxybelus bicolorisquama YASUMATSU, Trans. Sapporo Nat. Hist. Soc. 1 (1935) 41.

Male. Formosa, Tainan.

OXYBELUS (OXYBELUS) BICOLORISQUAMA var. KANKAUENSE Strand.

Oxybelus bicolorisquama var. *kankauensis* STRAND, Internat. Ent. Ztschr. 16 (1922) 172.

Male? Formosa, Kankau.

OXYBELUS (OXYBELUS) CANESCENS Cameron.

Oxybelus canescens CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 278, pl. 10, fig. 22.

Oxybelus canescens BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 320; male.

Oxybelus canescens DALLA TORRE, Cat. Hymen. 8 (1897) 639.

Oxybelus canescens ROTHNEY, Trans. Ent. Soc. London (1903) 106.

Oxybelus canescens PAIVA, Journ. and Proc. Asiatic Soc. Bengal 2 (1906) 348.

Male? Bengal, Barrackpore, Siliguri.

OXYBELUS (OXYBELUS) CEYLONICUM Cameron.

Oxybelus ceylonicus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. 41 (1896) 79.

Oxybelus ceylonicus AYYAR, Journ. Bombay Nat. Hist. Soc. 24 (1916) 559.

OXYBELUS (OXYBELUS) CEYLONICUS Cameron, 1900, nec Cameron, 1896 = OXYBELUS (OXYBELUS) TAPROBANENSE Pate, q. v.

Oxybelus ceylonicus CAMERON, Ann. & Mag. Nat. Hist. (7) 5 (1900) 40.

Oxybelus taprobanensis PATE, Ent. News 41 (1930) 20.

OXYBELUS (OXYBELUS) FLAVIPES Cameron.

Oxybelus flavipes CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 279.

Oxybelus flavipes BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 319.

Oxybelus flavipes DALLA TORRE, Cat. Hymen. 8 (1897) 641.

Oxybelus flavipes ROTHNEY, Trans. Ent. Soc. London (1903) 106.

OXYBELUS (OXYBELUS) FORTICARINATUS Cameron = OXYBELUS (OXYBELUS) LAMELLATUM Olivier, q. v.

Oxybelus forticarinatus CAMERON, Journ. Bombay Nat. Hist. Soc. 18 (1908) 304; female, male.

Oxybelus lamellatus TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 192; female, male.

OXYBELUS (OXYBELUS) FULVICAUDIS Cameron.

Oxybelus fulvicaudis CAMERON, Journ. Bombay Nat. Hist. Soc. 18 (1908) 303; female.

Oxybelus fulvicaudis AYYAR, Journ. Bombay Nat. Hist. Soc. 24 (1916) 559.

Female. India, Bengal.

OXYBELUS (OXYBELUS) FULVOPILOSUM Cameron.

Oxybelus fulvopilosus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 279, pl. 10, fig. 23; female.

Oxybelus fulvopilosus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 319; female.

Oxybelus fulvopilosus DALLA TORRE, Cat. Hymen. 8 (1897) 641; female.

Oxybelus fulvopilosus ROTHNEY, Trans. Ent. Soc. London (1903) 106.

Female. India, Bengal.

OXYBELUS (OXYBELUS) FURCIFERUM Turner.

Oxybelus furcifer TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 191; female, male.

Female, male. India, Bengal.

OXYBELUS (OXYBELUS) INSULARE Kohl.

Oxybelus insularis KOHL, Termesz. Füzet. 8 (1884) 109; female.

Oxybelus insularis CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 276.

Oxybelus insularis BINGHAM, Proc. Zoöl. Soc. (1896) 447; Faun. Brit. Ind., Hymen. 1 (1897) 318; female; DALLA TORRE, Cat. Hymen. 8 (1897) 641; female.

Female. Ceylon.

OXYBELUS (OXYBELUS) LAMELLATUM Olivier.

Oxybelus lamellatus OLIVIER, Encycl. Method., Insect. 8 (1811) 593.

Oxybelus Savignyi SPINOLA, Ann. Ent. Soc. France 7 (1838) 463; male.

Oxybelus Andalusicus SPINOLA, Ann. Ent. Soc. France (2) 1 (1843) 136; male.

Notoglossa sagittata DAHLBOM, Hymen. Europ. 1 (1845) 514; female.

Oxybelus arabs LEPELETIER, Hist. Nat. Insect., Hymen. 3 (1845) 212; female.

Oxybelus squamosus SMITH, Trans. Ent. Soc. London (1875) 38; female, male.

Notoglossa sagittata LICHTENSTEIN, Ann. Ent. Soc. France 64 (1875) xii.

Notoglossa arabs LICHTENSTEIN, Ann. Ent. Soc. France 64 (1875) xii.

Alepidaspis diphyllus A. COSTA, Rendic. Accad. Sci. Fis. Napoli 21 (1882) 197 [female].

Alepidaspis frondigera A. COSTA, Bol. Ent. Soc. Ital. 15 (1883) 334; male.

Oxybelus squamosus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 276, pl. 10, fig. 24.

Oxybelus squamosus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 315; female.

Oxybelus squamosus DALLA TORRE, Cat. Hymen. 8 (1897) 648.

Oxybelus squamosus ROTHNEY, Trans. Ent. Soc. London (1903) 106.

Oxybelus forticarinatus CAMERON, Journ. Bombay Nat. Hist. Soc. 18 (1908) 304; female, male.

Oxybelus squamosus LEFROY, Ind. Ins. Life (1909) 209 (Biol.).

Oxybelus squamosus FLETCHER, South Indian Insects (1914) 280 (Biol.).

Oxybelus forticarinatus AYYAR, Journ. Bombay Nat. Hist. Soc. 24 (1917) 559.

Oxybelus lamellatus TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 192; female, male.

Female, male. India, Bengal, Punjab; Mesopotamia to Morocco.

OXYBELUS (OXYBELUS) LATILINEATUM Cameron.

Oxybelus latilineatus CAMERON, Journ. Bombay Nat. Hist. Soc. 18 (1908) 302; female.

Oxybelus latilineatus AYYAR, Journ. Bombay Nat. Hist. Soc. 24 (1917) 559.

Female. India, Bombay.

OXYBELUS (OXYBELUS) LEWISI Cameron.[24]

Oxybelus Lewisi CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 282.

Oxybelus lewisi BINGHAM, Proc. Zoöl. Soc. (1896) 447; Faun. Brit. Ind., Hymen. 1 (1897) 320.

Oxybelus lewisi DALLA TORRE, Cat. Hymen. 8 (1897) 642.

Oxybelus lewisi MATSUMURA, List useful Insects Japan (1908) 132.

Oxybelus lewisi YASUMATSU, Trans. Sapporo Nat. Hist. Soc. 14 (1935) 38.

Ceylon, Nugata. (? Japan, Hokkaido, Honshu).

OXYBELUS (OXYBELUS) LINGUIFERUM Turner.

Oxybelus (Notoglossa) linguifera TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 193; female.

Female. India, Punjab.

OXYBELUS (OXYBELUS) NANUM Bingham.

Oxybelus nanus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 317; male.

Male. Burma, Rangoon.

OXYBELUS (OXYBELUS) NIGRITULUM Turner.

Oxybelus nigritulus TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 189; female, male.

Female, male. Assam, Shillong.

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[24] *O. lewisi* Cameron and *O. taprobanense* Pate (= *O. ceylonicus* Cameron, 1900 *nec* Cameron, 1896), were originally described by Cameron as "without laminæ" [i. e., squamæ] and are still known only from the unique types, the former presumably in the British Museum and the latter in the Hope Museum at Oxford. I have not seen specimens of either of these, but they may eventually prove to be species of *Crabro* as have *O. bellus*, *O. nitidus*, and *O. argenteolineatus*, also described by Cameron in the same paper as species of *Oxybelus* "without laminæ". On the other hand, they may be merely teratological forms of other valid species, since occasionally specimens with malformed or aborted squamæ have been found and sometimes described as discrete species, e. g., *Alepidaspis diphyllus* A. Costa, 1882 (= *Oxybelus lamellatum* Olivier, 1811).

OXYBELUS (OXYBELUS) NITIDUS Cameron = CRABRO NITIDUS (Cameron).

Oxybelus nitidus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 231.

Crabro nitidus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 330; female.

Oxybelus nitidus DALLA TORRE, Cat. Hymen. 8 (1897) 646.

OXYBELUS (OXYBELUS) PHILIPPINENSE sp. nov.

Female. Philippines.

OXYBELUS (OXYBELUS) PHILIPPINENSE forma RETICULATUM fo. nov.

Female. Mindanao.

OXYBELUS (OXYBELUS) PICTISENTIS Cameron.

Oxybelus aurifrons CAMERON, Journ. Bombay Nat. Hist. Soc. 14 (1902) 287; male [*nec* Smith, 1856].

Oxybelus pictisentis CAMERON, Journ. Bombay Nat. Hist. Soc. 18 (1908) 302; female.

Oxybelus pictisentis AYYAR, Journ. Bombay Nat. Hist. Soc. 24 (1917) 559.

Oxybelus aurifrons TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 191; female [*nec* Smith, 1856].

Oxybelus pictiscutis TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 190; male. (*Pictiscutis* Turner = emendation for *pictisentis* Cameron, q. v.).

Female, male. India, Bombay, Punjab.

OXYBELUS (OXYBELUS) ROBUSTUM Cameron.

Oxybelus robustus CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 276, pl. 10, fig. 21; female.

Oxybelus robustus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 315; female.

Oxybelus robustus DALLA TORRE, Cat. Hymen. 8 (1897) 647; female.

Oxybelus robustus ROTHNEY, Trans. Ent. Soc. London (1903) 106.

Female. India, Bengal Province, Bombay.

OXYBELUS (OXYBELUS) RUFICORNIS Smith.

Oxybelus ruficornis SMITH, Cat. Hymen. Brit. Mus. 4 (1856) 388; female.

Oxybelus ruficornis CAMERON, Mem. and Proc. Manchester Lit. and Phil. Soc. (4) 3 (1890) 276.

Oxybelus ruficornis BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 317; female.

Oxybelus ruficornis DALLA TORRE, Cat. Hymen. 8 (1897) 647.

Oxybelus sabulosus SMITH, Cat. Hymen. Brit. Mus. 4 (1856) 388; female. (= *Oxybelus agile* SMITH, q. v.)

Oxybelus agilis TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 190; male.

Oxybelus squamosus SMITH, Trans. Ent. Soc. London (1875) 38; female, male. (= *Oxybelus lamellatum* Olivier, q. v.).

Oxybelus lamellatus TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 192; female, male.

Female. India.

OXYBELUS (OXYBELUS) SULUENSE sp. nov.

Male, female. Borneo, Sandakan. Palawan, Puerto Princesa.

OXYBELUS (OXYBELUS) TAPROBANENSE Pate.[22]

Oxybelus ceylonicus CAMERON, Ann. & Mag. Nat. Hist. (7) 5 (1900) 40 [*nec* Cameron, 1896].

Oxybelus taprobanensis PATE, Ent. News 41 (1930) 20.

OXYBELUS (OXYBELUS) TRANSIENS Turner.

Oxybelus transiens TURNER, Mem. Dept. Agr. Ind. Ent. Ser. 5 (1917) 191; female.

OXYBELUS (OXYBELUS) TRIDENTATUM Smith.

Oxybelus tridentatus SMITH, Cat. Hymen. Brit. Mus. 4 (1856) 387; male.

Oxybelus tridentatus CAMERON, Mem. and Proc. Manchester Lt. and Phil. Soc. 3 (4) (1890) 276.

Oxybelus tridentatus BINGHAM, Faun. Brit. Ind., Hymen. 1 (1897) 317, fig. 88; male.

Oxybelus tridentatus DALLA TORRE, Cat. Hymen. 8 (1897) 649.

Male. India. Lower Burma, Tenasserim.

OXYBELUS (OXYBELUS) XANTHOGASTER sp. nov.

Female. Borneo, Lebang Hara.

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[22] See remarks in footnote 21 on *O. lewisi*. In the case of *O. taprobanense* there is a possibility that since there is neither description nor mention made of the propodeal spine or mucro, it may be referable to either *Belomicrus* or *Belomicroides* inasmuch as Cameron (loc. cit.) definitely states that ". . . . this species is referable to *Oxybelus*, rather than to *Crabro*, although it has not got any thoracic laminæ, through the submarginal cellule being confluent with the first discoidal, and through the eyes not being convergent toward the vertex . . ."

ILLUSTRATION

PLATE 1

FIG. 1. *Oxybelus suluense* sp. nov., squamæ and mucro of male.
2. *Oxybelus banksi* (Ashmead), squamæ and mucro.
3. *Oxybelus banksi* forma *divaricatum* fo. nov., squamæ and mucro.
4. *Oxybelus suluense* sp. nov., mucro of female.
5. *Oxybelus philippinense* sp. nov., clypeus.
6. *Oxybelus xanthogaster* sp. nov., mucro.
7. *Oxybelus suluense* sp. nov., clypeus of female.
8. *Oxybelus suluense* sp. nov., clypeus of male.
9. *Oxybelus xanthogaster* sp. nov., clypeus.
10. *Oxybelus banksi* (Ashmead), clypeus.
11. *Oxybelus philippinense* sp. nov., squamæ and mucro.
12. *Oxybelus æquipunctatum* sp. nov., squamæ and mucro.

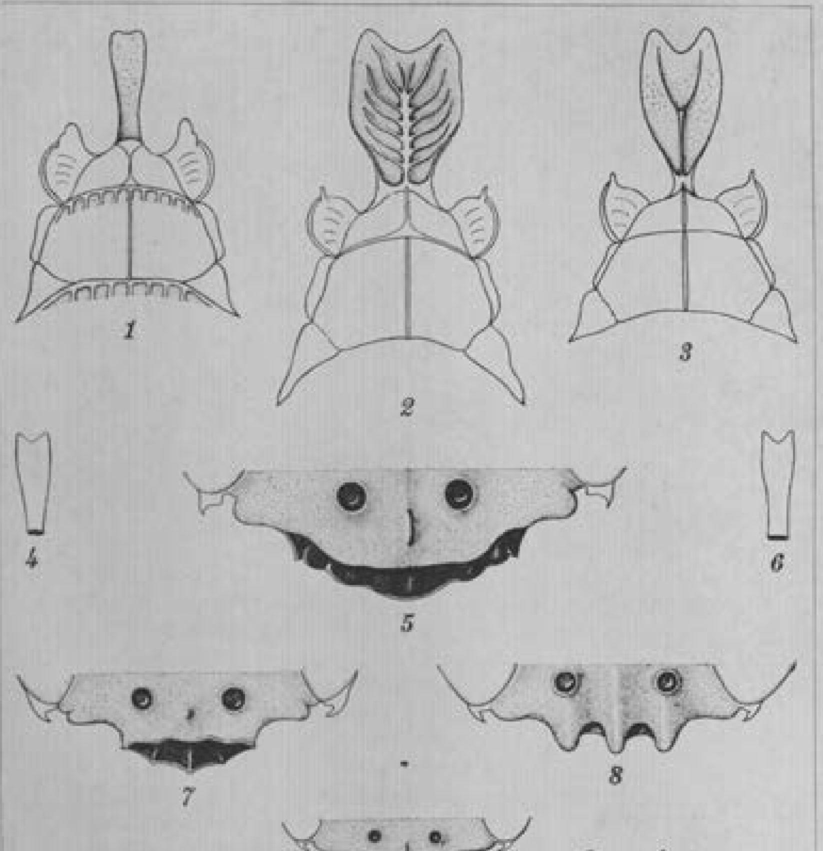

PLATE 1.

NOTES ON EUPHORBIACEÆ, WITH A NEW GENUS AND A NEW SUBTRIBE OF THE EUPHORBIEÆ

By Leon Croizat
Of the Arnold Arboretum, Harvard University

ONE PLATE AND ONE TEXT FIGURE

In a recently published paper(7) I mentioned *Euphorbia Cleopatra* Baill., a New Caledonian endemic, as possibly related to *E. Ridleyi* Croiz. (*E. Synadenium* Ridl.), which is strictly confined to the vicinity of Singapore. At the time *E. Cleopatra* was known to me from description, but later I was able to examine specimens of it, including the actual type, courteously loaned by the Museum d'Histoire Naturelle of Paris. For this extraordinary favor I am indebted to the kindness of Prof. H. Humbert and Prof. A. Guillaumin of that institution. To Dr. P. Santer, of the Jardin de l'Etat in Brussels, I am indebted for the receipt of cymes of *Monadenium* from type specimens.

A perfunctory examination of the material makes it clear that Baillon altogether misunderstood the characters of this very distinct plant. The collector, Pancher, showed excellent judgment in labelling it *in schedis* as a new genus, calling it *Cleopatra Candelabra*. The systematic and taxonomic work of Baillon is well known to be of uneven quality, but it is surprising that Pancher's generic name, cited by Baillon as a synonym of *Euphorbia Cleopatra*, was never accepted by later authors. Boissier did not see the type specimen. He used Baillon's binomial,(4) although a hint of misgiving may be read in his notes when he redescribed the species from Baillon's account. Pancher himself, working in collaboration with Sebert,(15) listed *E. Cleopatra*, and made no mention of his former unpublished generic name, even as a synonym.

Baillon(2) presents *E. Cleopatra* together with, and under the section, *Decadenia*. *Decadenia* is outstanding even among the often peculiar sections that have been proposed within the Linnæan genus, *sensu latiore*, and which rather hopelessly confuse its classification. It is described as follows:

Calyx (involucrum *Lamk.*) profunde 5-partitus, laciniis integris reflexis. Stamina (flores masculi *Lamk.*) 5-fasciculata, filamentis ad medium articulatis. Glandulae staminales (calyx masc. *Lamk.*) inaequales imbricatae. Glandulae hypogitnae 5 calycis laciniis alternae, basi attenuata, apice incrassato recte truncato; quarum 5 sub pistillo insertae staminum fasciculis alternae, 5 alterae exteriores cum calycis lobis alternantes. Pistillum stipitatum 3-merum, disco cupulaeformi brevi inaequali 5-6-lobo (calyce *Lamk.*) munitum.—BAILLON, Species *Euphorbiacearum*, 213, 214.

On the surface this diagnosis characterizes an incredible *Euphorbia*, granting that it makes sense at all. The "glands" (nectaria, as I understand these organs) are stated correctly to be ten in Baillon's original description. The error found in the generic diagnosis is easily detected, and may not be serious. However, so far as I know, a true *Euphorbia* cannot have nectaria inserted or attached "below the pistil."

Genus NEOGUILLAUMINIA Croizat gen. nov.

Perianthii laciniis 4 ad 5, liberis, petaloideis, eglandulosis, fasciculis florum masculorum oppositis. Fasciculis florum masculorum 4 ad 5, bracteatis. Flore foemineo centrali, 3-loculari, bracteato. Nectariis 8 ad 10, binis inter quaeve fascicula florum masculorum, stipitatis, toro (seu apici incrassato inflorescentiae pedunculi) insidentibus, a flore foemineo radiantibus.

Perianth of 4 to 5 free petaloid eglandular appendages opposite the fascicles of male flowers. Fascicles of male flowers 4 to 5, bracteate. Female flower central, 3-locular, bracteate. Nectaria (glands auct.) 8 to 10, in pairs between the fascicles of male flowers, stipitate, attached to the torus (enlarged apex of the inflorescence peduncle), radiating from the female flower.

NEOGUILLAUMINIA CLEOPATRA (Baill.) comb. nov.

Euphorbia Cleopatra BAILLON, Adansonia (1861) 213; BOISSIER, DC. Prodr. 15^{2} (1864) 1265; SEBERT and PANCHER, Sebert, Notice Bois Nouv. Caléd. (1874) 237.

Cleopatra Candelabra PANCHER, mss. in schedc, et in syn. apud Baillon.

Type specimen: Pancher 5766', Coll de bois No. LIV" Bel arbre de 20 à 25 mètres, à branches presque verticillées, peu rameuses, élégamment relevées en candelabre. Suc propre trées abondant. Fleurs blanchâtres en février. Ravins ferrugineux du N. E. Calédonie."—PANCHER, *mss. in scheda.*

Type in the Herbarium of the Museum of Paris.

The brittleness of the type specimen, and of a second sheet representing the same species (Franc 263 a, Prony, January, 1914) also kindly loaned by Professor Humbert, discourages handling for the purpose of describing in detail the vegetative parts. A detailed diagnosis does not seem to be required for this very striking monotype. The notes of Baillon, Boissier, Pancher, and Sebert appear adequate once the inflorescence has been reinterpreted. The label of the type specimen definitely describes the plant as a tree 20 to 25 meters tall. The height given by Baillon as 6 to 8 meters in his diagnosis was written at first on the label by Pancher, and later crossed out. I cannot detect traces of stipules, and incline to the belief that they are absent. The plant seems to possess horticultural merits no less than an interest for the student of comparative morphology. The "flowers," although not more than 2 cm in diameter, have conspicuous whitish petaloid appendages. Specimens most likely exists that match the beauty of the "frangipanis" of common cultivation.

It is fortunate that the International Code does not absolutely require the acceptance of a sectional name when its rank is changed, because in the case under consideration the elevation of *Decadenia* would require an amended description. Pancher's binomial, published so far as I have been able to establish only in synonymy, may also be disregarded, since the use of a name in synonymy does not constitute proper publication. While the just regard of Pancher's achievement in recognizing at least once this plant as a distinct genus suggests that his binomial be reinstated, it is feared that such use of *Cleopatra* may encourage the assumption that Pancher's plant is only one among the controversial segregates of *Euphorbia*. In presenting a new generic name in honor of Prof. A. Guillaumin it is my intention to dissociate this peculiar plant from the species that indeed belong to the *Euphorbia* of Linnæus.

So far as I know, *Neoguillauminia* is monotypic, and I have already spoken of it as such. Thanks to the courtesy of Professor Humbert I have had the opportunity of examining a leaf of the type of *E. Brownii* Baill. (Baudin ? "Nouvelle Hollande, côte occidentale") which Baillon believed also to belong to *Decadenia*. Not having seen the "flowers" which are described as immature(3) I cannot decide whether or not this species, too, belongs to *Neoguillauminia*. I am inclined to the negative, however, since the midrib does not extend to the apex of the blade as in *N. Cleopatra*, and the nervation has a different character.

The systematic position of *Neoguillauminia* raises issues not less interesting than those of plant migration and comparative morphology which must for the present remain outside the scope of this treatment. Accepting the authority of the most recent reference work on the Euphorbiaceæ,(12) the Euphorbieæ possess a normally bisexual cyathium, the individual male flowers reduced to a single stamen. The tribe includes ten genera, *Anthostema, Dichostemma,*[1] *Diplocyathium, Euphorbia, Calycopeplus, Elæophorbia, Synadenium, Monadenium, Stenadenium, Pedilanthus.* The relationship among these genera with the exception of *Tithymalus*[2] is interpreted by Pax(11) in a fan-shaped graph in which, reading left to right, *Diplocyathium* stands alone, *Anthostema* and *Dichostemma* are placed in a single affinity, *Calycopeplus, Euphorbia,* and *Elæophorbia* are grouped together, and *Synadenium, Monadenium,* and *Stenadenium* share a common branch of the tribal tree.

In a discussion of the Euphorbieæ the cyathium must necessarily be considered, because in current taxonomy it is used as the character of *Euphorbia* and as the tribal character of the entire group. The nature and genesis of this peculiar inflorescence have been treated in numerous works among which Schoute's(14) Haber's,(9) and one contribution of my own which was written in a wholly informative spirit(6) may be recorded.

The appended bibliography will be of assistance to those interested in forming an independent opinion on the subject. The

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[1] The name is frequently erroneously spelled *Dichostema.*

[2] The use made by Small(16) of *Tithymalus* instead of *Pedilanthus* appears to have given rise to a certain amount of criticism. Judging Small's interpretation to be unassailable I quote from Miller(10) the presentation of *Tithymalus* as it occurs in the original, with very minor omissions: "The Characters are: the Flower has an Empalement of one Leaf, indented in three Parts: it has one Petal which is shaped like a Slipper; it is of a thick fleshy Consistence. Under the upper Part of the Flower are situated ten Stamina, which are inserted in the Receptacle of the Flower; they are slender, and terminated by globular Summits; in the Center is situated a roundish three-cornered Germen, supporting three bifid Styles, crowned by oblong Stigmas. The Germen afterwards becomes a roundish Capsule having three Cells, each containing one oval Seed. This Genus of Plants is by Linnæus joined to the *Euphorbia.* But as the Flowers of this Genus differ greatly in their structure from those of *Euphorbia,* I have chosen to separate them, and have continued the old Title of *Tithymalus* to the Genus." Miller's lucid account is the earliest recorded segregation from the Linnæan farrago. It should be noticed that Miller cites in synonymy the genus *Tithymaloides* Tourn., not *Tithymalus* eiusd. auct., and introduces two species, with synonyms, respectively, *Tithymaloides frutescens folio myrti amplissimi* Tourn. *Inst.* 654, and *Tithymaloides foliis laurocerasi folio non serrato Hort. Elth.* 383, which could scarcely be clearer. There is no question of *nomen confusum* as *Tithymalus* and *Pedilanthus* have been applied to distinct groups of plants by the majority of authors.

"discovery" of *Neoguillauminia* hidden for nearly four score years in the *Euphorbia* jungle indicates better than anything else how much remains to be done in the proper interpretation of the Euphorbiaceæ. It is clear that the question of the cyathium is still in a controversial stage, and I venture to surmise that it may not be solved satisfactorily except through the collective endeavors of students of the various branches of botanical discipline.

Today all investigators agree that the cyathium is an inflorescence. This unanimity of opinion is gratifying. The taxonomical concept that subscribes to the Linnæan genus fundamentally interprets the cyathium as a flower. Regardless of side issues, however, the cyathium is generally accepted as representing an aggregate of flowers with their appurtenances: the female flower (ovary *auct.*) is surrounded by free or fascicled male flowers (stamens *auct.*). The sexual organs are included within a perianth (involucre) composed of two adnate series: the lobes, usually introrse, or erect, facing the fascicles of male flowers; the nectaria (glands) usually extrorse and melliferous, and often furnished with petaloid appendages.

Much attention has been given to the fact that the fascicles of male flowers show a spiral arrangement apparently in harmony with the laws of phyllotaxis, and the vernation of highly specialized species has been discussed in general terms. In my judgment it is wholly irrelevant whether or not the male flowers of *Euphorbia* show a spiral ratio amenable to fractional expression, because the cyathium is a shortened floral axis, not a foliate branchlet. I am not aware that the phyllotaxic rhythm of *Salicaceæ*, *Malvaceæ*, and others, extends to the ament in the one case and to the staminal column in the other, and it seems a far-fetched interpretation that attributes to the lobes of the cyathium the duties and prerogatives of phyllodes in good standing. Troll's interpretation of the cyathium,(17) which was promptly and effectively disposed of by Goebel,(8) appears still to influence the premises of some investigators.

The Euphorbieæ are correctly treated as a tribe of the Euphorbiaceæ Hippomaneæ. In the amentlike inflorescence of this important group all the parts that are found in the cyathium appear in the same or nearly the same degree of evolution (or retrogression, according to the opinion of some authors). In the cyathium occur laciniæ, scales, nectaria, clusters of male flowers, and calyculi closely approaching, if not identical with, those of the Hippomaneæ. So far as I am able to discern, the difference, aside from the obvious results of adnation, is mainly that in the Hippomaneæ the female flowers are inferior in the scheme of the whole inflorescence, while in the Euphorbieæ the single female flower is strictly superior and terminal in respect to the axis to which the male flowers are attached.[1] Thus the floral axis of the Euphorbieæ and of the Hippomaneæ may be conceived to vary fundamentally only in the position of the female flower. All the differences due to adnation and to crowding of parts appear to depend in the last analysis upon the position of the female flower, or, let us say, upon the adaptation to the method of pollination either by wind and gravitation, or by insects. At least within the limits of these notes it is permissible to conclude that a terminal female flower on the bisexual florigerous axis constitutes the essence of a member of the Euphorbieæ. Important but not essential is an involucre to include the sexual organs.

On the basis of this assumption a sharp distinction is established between the Euphorbieæ that possess a cyathium with a more or less cup-shaped involucre, and those which have not such a cyathium. Although in *Euphorbia* are found species with peculiar cyathium structures (*E. pedilanthoides*, *E. capitulata*, *E. complexa* and others) it is manifest that the zygomorphic inflorescence of *Tithymalus* and the peculiar cyme of *Anthostema* require separate consideration. Nor can any species or genus belong to Euphorbieæ which lacks a terminal female flower.

Baillon, in fact, excluded *Anthostema* from the Euphorbieæ and attributed it to the Hippomaneæ, near *Sapium*,(1) on the ground that in *Anthostema* the female flower has a lateral, not a central, position in relation to the male flowers. The student of botanical history is here treated to a classic Baillonian procedure in which a mistaken observation is made the starting point of a treatment that is unassailable on the ground of formal logic, once the main premise has been granted. So far as I have been able to learn in *Anthostema* the so-called pedicel of the female flower represents the true florigerous axis, the latter being distorted by the lateral growth of a voluminous aggregate of male flowers. Obviously, the female flower of *Anthostema* is still superior and terminal; a true sympodium need not be mistaken for a zigzag series of internodes. In other words a growing axis does not lose its essential monoxial nature when it is forced out of perpendicular alignment by the sheer thrust of secondary axes arising laterally from it. The inflorescence of *Anthostema* may be interpreted for the sake of elucidation as a dimidiate involucre of *Euphorbia*. The nectaria of *Anthostema*, however, have a different position from those of *Euphorbia:* they stand between the clusters of male flowers and are attached by a narrow base to one side of the gynophore. It is plain that *Anthostema* belongs to the Euphorbieæ and that the argument of Baillon, while extremely interesting, is based upon a fundamental misapprehension of the nature of the tribe.

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[1] Terminal female flowers are known in Euphorbiaceæ outside of Euphorbieæ in *Micrococca*, *Omphalea*, and others. The points at issue, however, are the constancy of characters and the general relationship.

Pierre, the author of *Dichostemma*, doubted(13) whether his genus would prove better than a section of *Anthostema*. The two genera, in fact, have several characters in common: they possess calyculate male flowers, nectaria placed between clusters of bracteate male flowers, and comparatively small involucres or perianth bracts. In *Dichostemma*, however, occurs a cup-shaped, mono- or bisexual perianth with four to five nectaria alternating with as many clusters of male flowers, and radiating from the female flower or its rudiment. The perianth of *Dichostemma* is a symmetric cyathium, which brings the genus close to *Euphorbia*, not an asymmetric perianth bract like that of *Anthostema*. From *Euphorbia Dichostemma* differs in the position and attachment of the nectarium, which in the former belongs to the involucral series and is free from the base of the gynophore. In *Dichostemma* the nectarium, voluminous in proportion to the generally small cyathium, is adnate both to the perianth and to a somewhat enlarged torus at the base of the gynophore. Thus it acts like a septum, or partition, between the clusters of male flowers, and its lateral faces are excavated better to accommodate such clusters. When the nectarium falls, a subdolabriform to dolabriform scar marks its former insertion upon the torus. The anterior face of the nectarium presses against the gynophore which, being surrounded by four nectaria, tends to assume a manifest quadrangular shape.

N. E. Brown(5) gives the following interpretation of *Dichostemma:*

> In structure the involucre really consists of 8 bracts more or less fused together: an outer series of 4, forming 4 pocket-like cavities at the corners containing the stamens, and an inner series of 4 alternating with the outer and converted into glands, surrounding in some of the terminal involucres a perfect female flower, in the others a very rudimentary abortive female flower, reduced to a very short solid square central body.

It is difficult if not impossible to agree that bracts can become transformed into glands, and it seems probable that N. E. Brown really means that four clusters of male flowers are reduced and adapted to nectariferous (glandular) functions. This is a distinct possibility in my opinion, but the problem presented by the nectaria of Euphorbieæ is not to be solved except by the investigation of all the nectaria of the Euphorbiaceæ, and as such must be left entirely outside the limits of this treatment.

Calycopeplus is as perfect an example of a connecting link as a morphologist may wish for. Let us suppose that three to five male calyculi of one of the Hippomaneæ, for instance, *Sapium*, are grouped together around a female superior flower, and that the faces of the calyculi that are away from the gynophore become adnate to form a continuous perianth with a minute nectarium at its rim where the sutures have developed. The result of the suggested process is the inflorescence of *Calycopeplus*, barring only irrelevant details. *Calycopeplus* is very near *Euphorbia* and may be accepted for an archetype of it. Its relationship with peculiar species so far accepted as *Euphorbia*, *E. complexa* for instance, requires further study.

Euphorbia is too well known to require elucidation. *Tithymalus*[4] presents considerable difficulties of morphological interpretation, and one of its historic segregates, *Cubanthus*, may not be discussed except in an exhaustive treatment, which is impossible here. The issue that *Tithymalus* and *Cubanthus* offer to the student's attention full series of cyathia of *Euphorbia* in which appears a tendency towards zygomorphism should be investigated, beginning with good material of a Madagascar species, *E. pedilanthoides*, which I regret to know only from description. *Cubanthus* appear to stand alone, probably connecting certain *Euphorbia* (for instance, the species of the so-called section *Poinsettia*) with *Tithymalus*. It may be suggested, at least as a line of investigation, that *Tithymalus* and *Cubanthus* represent in Euphorbieæ a distinct branch to be located not very far from the horizon of *Calycopeplus*. As such I have illustrated them (text fig. 1).

Monadenium may be disposed of in a brief review by comparing it with the species of the so-called section *Poinsettia*. In the latter the normal cyathium has one nectarium of small size in respect to the involucre; in *Monadenium* the nectarium is much enlarged, and surrounds more than three-quarters of the perianth's mouth, leaving free a deep cleft through which protrudes the gynophore. *Stenadenium*, which I know only from description, does not appear to differ basically from *Monadenium*, except in the elongation of the nectarium above the mouth of the involucre. *Synadenium* is distinct from *Euphorbia* in that the nectaria are connate in a continuous ring. The imperfect cyathium which ends the main axis of the cyme of *Syna-*

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[4] Needless to say *Tithymalus* is accepted throughout this contribution in lieu of *Pedilanthus*, which is the generic name usually known to taxonomists.

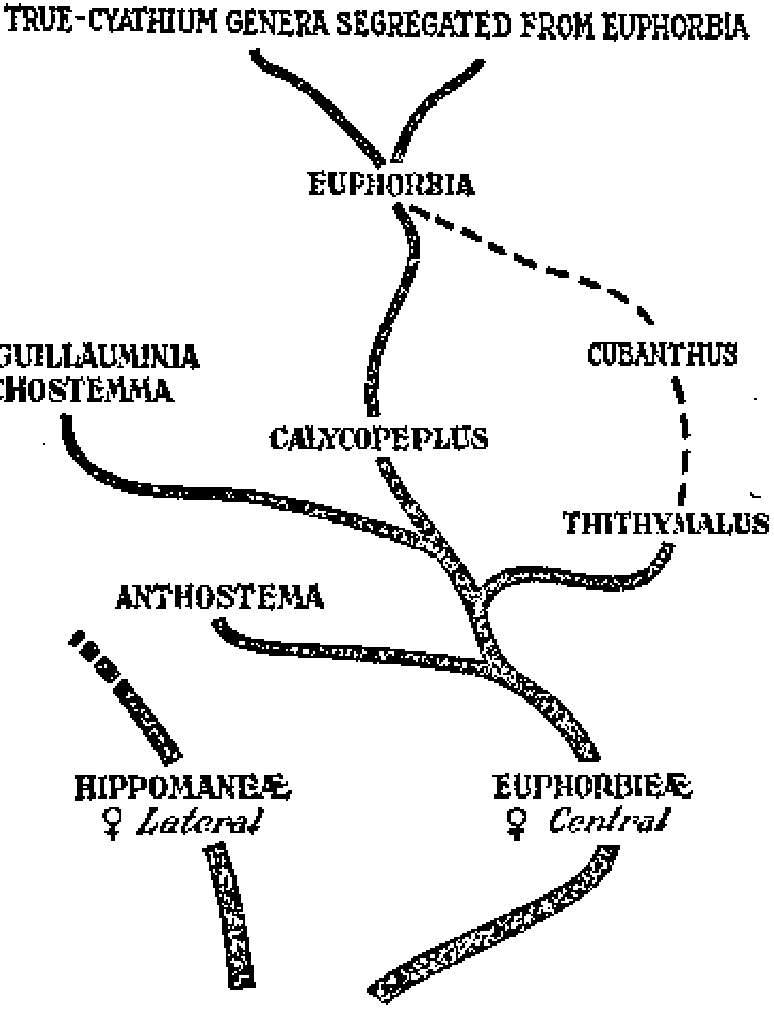

Fig. 1. The relationship of the Euphorbieæ. Position of the female flower with regard to the whole floriferous axis (male and female inflorescences excl.).

denium, however, is very frequently observed with discrete nectaria, which should be duly noticed, and should give pause to taxonomists who segregate *Synadenium* from *Euphorbia* on the merit of "floral characters." *Calycopeplus*, *Monadenium*, *Dichostemma*, and *Synadenium* are illustrated in Plate 1, figs. 2 to 5, together with schematic floral diagrams intended to emphasize the position, and, in part, the size of the nectaria in the general plan of the cyathium. Excellent illustrations of *Anthostema* are available elsewhere in the literature.

Neoguillauminia has a superior central female flower which definitely settles its systematic position among the Euphorbieæ. It lacks a cup-shaped perianth which places it outside *Calycopeplus*, *Euphorbia*, and the true cyathium genera. It stands apart from *Tithymalus* in general characters. It barely nears *Anthostema* in the nectaria being inserted between the clusters of male flowers. *Dichostemma* it approaches in at least three points, as follows: (*a*) The presence of a torus at the base of the gynophore to which are attached the nectaria; (*b*) the presence of bracts surrounding the flowers; (*c*) the position of the nectaria which are radially located in respect to the female flower.

The differences between the two genera, aside from habit characters, may be summarized as follows: (*a*) In *Dichostemma* a perfect involucre occurs; in *Neoguillauminia* the perianth is reduced to four or five petaloid appendages and the nectaria are wholly free. (*b*) In *Dichostemma* the nectaria are four or five; in *Neoguillauminia* they are twice that number. (*c*) In *Dichostemma* the male flowers are calyculate, like those of *Anthostema*; in *Neoguillauminia* they are ecalyculate, like those of *Euphorbia*.

The difference in male flowers and in perianth between *Neoguillauminia* and *Dichostemma* is undoubtedly important, and it is furthermore undeniable that *Anthostema* is related to, and distinct from them, in characters which in the condition of present knowledge are so elusive as to stultify any attempt to group the three genera in a natural arrangement. I may venture the opinion that *Dichostemma* is the key genus of the systematic complex at hand, and that *Neoguillauminia* and *Anthostema* are about equidistant from it. *Neoguillauminia* lacks a cyathium-like perianth, but its ultimate inflorescence[6] is symmetrically disposed in respect to the florigerous axis, and the free petaloid appendage that subtends the clusters of male flowers may correctly be interpreted to represent a lobe or scale, the elements of the perianthic series being suppressed opposite the nectaria. *Anthostema's* ultimate inflorescence is asymmetric, but in it appear the calyculate male flowers that are found in *Dichostemma* and missing in *Neoguillauminia*. Thus the main issue that must be solved to group the three genera in appropriate subtribes is fundamentally expressed in the query: Is the symmetry, or asymmetry, of the ultimate inflorescence of greater systematic significance than the presence, or absence, of calyculate male flowers?

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[6] As "ultimate inflorescence" I understand the aggregate of male and female flowers which is usually inclosed within the involucre, distinguishing it from the "inflorescence" which in the works now current connotates the cyme, or pseudoumbel.

I am not aware that the answer can be returned with the subsidy of the knowledge at hand, and I regret that too often classification is made imperfect by the want of careful morphologic interpretation. Considering as best I can at this hour the probable taxonomic value of calyculate and ecalyculate male flowers in Euphorbieæ I notice that the rudiment of a calyculus, or at least a peculiar swelling of the articulation of the filament, appears in *Cubanthus*, and I incline to the belief that individuals, if not species, of the Euphorbieæ may be found outside *Dichostemma* and *Anthostema* which possess traces of calyculi and, perhaps, calyculi in full development. I know that every conceivable aberration is present in some individual or species of the Euphorbieæ, involving cyathium structure, number of spines, development of axes, sexuality, and others. I may presume, consequently, that the value to be derived from the single character of the calyculus of the male flower is less important than that concerning the arrangement of the ultimate inflorescence.

Whether this assumption will prove true depends on the result of work as yet incomplete. It might be shown that the ultimate inflorescence of *Anthostema* is to be assimilated to a cyathium of *Dichostemma* in which the perianth is laterally cleft to the very base. Such clefts, although not reaching below the middle of the cyathium, are known in *Monadenium* and in *Euphorbia*. If it should ever be proved that the ultimate inflorescence of *Anthostema* is of this nature, the genus must be considered as a derivative from cyathium prototypes to which *Dichostemma*, *Calycopeplus*, and *Euphorbia* have remained true, and *Anthostema* on the strength of its calyculate male flowers would fall in the subtribe of *Dichostemma*. However, it is about as probable that the cyathium is composed of adnate series of scales subtending clusters of male flowers alternating with nectaria, all of which elements in the elongated florigerous axis of the prototype had a definite spiral disposition. In this case the character expressed by the calyculus of the male flowers has barely a relic value, and it is almost irrelevant by contrast with the characters to be derived by the symmetry of the ultimate inflorescence: *Neoguillauminia* must follow *Dichostemma*, and *Anthostema* must stand alone.

The systematic issue presented by *Neoguillauminia* and its allies *Dichostemma* and *Anthostema*, unfortunately, may not be held in abeyance awaiting the result of the work of the morphologist. At present I am inclined to the belief that *Neoguillauminia* and *Dichostemma* may be accepted as members of the same subtribe, for which I propose the name Neoguillauminiinæ.

Subtribus NEOGUILLAUMINIINÆ novum

Euphorbieæ. Inter subtribus omines nectariis (glandulis auct.) a flore foemineo radiantibus distincta.

Genus typicum: *Neoguillauminia*.

The affinities of the new subtribe with the remaining genera of the tribe are tentatively indicated in text fig. 1. In this figure no account is taken purposely of *Monadenium*, *Synadenium*, *Elaeophorbia*, and of the remaining cyathium genera which must follow *Euphorbia*. Grave doubts attach to the propriety of a concept that mistakes an inflorescence for a flower, insists on misconstrued "floral characters" all too readily segregates from the Linnæan genus monotypes or olygotypes like *Diplocyathium*, *Elaeophorbia*, and others, on the strength of nearly specialized structures. Such a concept at the same time overlooks, or repudiates, whole series of characters like appendages, septa, stipules, spines, and others common to hundreds of species forming the natural groups of *Euphorbia* L.

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ILLUSTRATIONS

PLATE 1

(Schematic drawings prepared by the author from specimens in fluid.)

FIG. 1. *Neoguillauminia*, inflorescence and floral diagram; inflorescence shortly before anthesis; about × 3.

2. *Calycopeplus*, inflorescence and floral diagram; cyathium at the beginning of anthesis; about × 9.3.

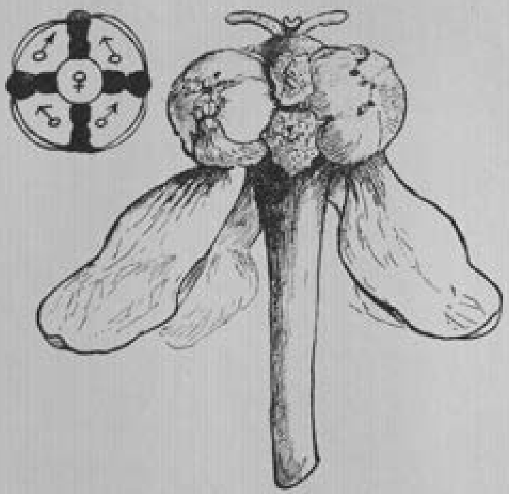
3. *Monadenium*, inflorescence and floral diagram; cyathium in anthesis; about × 4.

4. *Dichostemma*, inflorescence and floral diagram; cyathium shortly before anthesis; about × 3.3.

5. *Synadenium*, inflorescence and floral diagram; cyathium in the female stage of anthesis, about × 4.

TEXT FIGURE

FIG. 1. The relation of the Euphorbieæ; position of the flower with regard to the whole florigerous axis (male and female inflorescence *auct.*).



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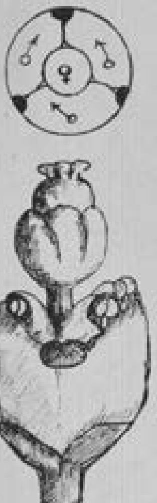

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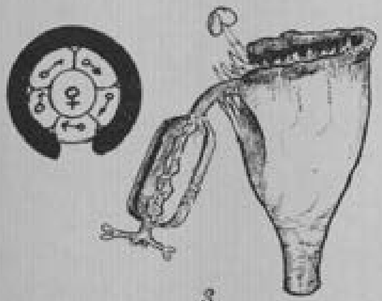

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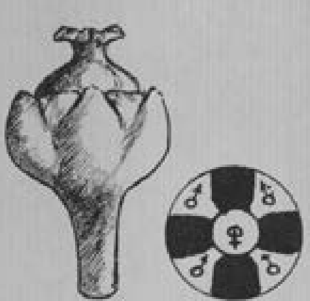

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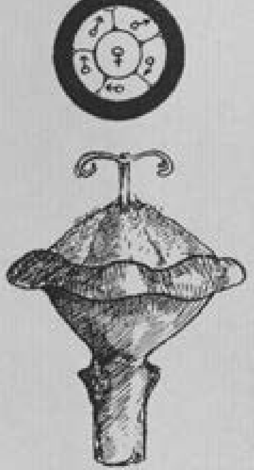

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PLATE 1.

ILOKO FURNITURE AND IMPLEMENTS

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TWO PLATES

In a previous paper, published in the Philippine Journal of Science,[1] we discussed Iloko constructions.

In this paper we shall try to describe as accurately as possible the different pieces of furniture and the implements used by the Iloko, excluding, however, anything that has reference to weaving (clothes, baskets, nets), hunting, fishing, and similar pursuits.

We shall avoid as much as possible all words that are obviously of Spanish origin, and we shall give only those that came to our personal notice, alphabetically arranged for the greater convenience of the missionary and the explorer.

ILOKO FURNITURE AND IMPLEMENTS

abbóng̃: Cover, wrapper. *Cf. akkúb* & *balkitan.*

akkúb: Cover, wrapper. *Akkúb* and *abbóng̃* may sometimes be used interchangeably. If not, only daily use can teach the student which of the two has to be used in any particular instance. However, *abbóng̃* is confined to cloth, paper, and similar material, and emphasizes the concept of "protecting;" while *akkúb* is a more general term and emphasizes the concept of "covering." The cloth that envelops a little babe, when it is taken out of doors, will be called *abbóng̃*; a tablecloth is either *abbóng̃* or *akkúb*; a pillowcase, the wrapper of a book, and the like, are *akkúb*. *Kalúb* is another name for "cover," and differs from *akkúb* in that it is the cover that rightly belongs to the object in question, for instance, the lid of a trunk, the earthen cover of an earthen jar, the eyelid, and the like, while *akkúb* is a cover for the time being, not forming a whole with the object it covers, for instance, a piece of wood, a stone, or a similar object used to cover a jar, for example. *Cf.* also *ap-áp.*

akló: Ladle. A spoonlike wooden instrument used to extract cooked food from a jar, a kettle, or some other cooking vessel. It is generally of one piece, consisting of a relatively long handle with a kind of blade much broader than the rest. The *akló* either is entirely straight (the rice ladle) or has a curved blade (the vegetable ladle). *Cf. sódo.* The scapula, or shoulder blade, is called *ak-akló* or *akloakló*.

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[1] Philip. Journ. Sci. 62 (1937) 67.

alát: A kind of basket made of close-woven bamboo. It has the form of a cylinder and is usually about 20 inches high and about 6 inches in diameter. Salt is generally kept in and sold by the *alát*.

alilí: Either of the two wooden handles of the Iloko bellows. Cf. *yubuyúban*. (Plate 2, fig. 11, c.)

allúd(an): A kind of basket resembling the *rang̃áya* in all its particulars, but smaller. The *allúdan* is larger than the *labbá*.

al-ó: Pestle. The Iloko pestle is a single rounded piece of wood, cut out in the middle so as to be easily grasped and kept in the hand by the user. Generally either of its two ends may be used indifferently. Cf. *alsóng̃*. (Plate 1, fig. 1.)

alsóng̃: Mortar. The Iloko mortar is a strong, heavy, mostly cylindrical piece of wood, or occasionally stone, scooped out in the center so as to form a hole, which is deep and comparatively narrow, except at the top, where it is gradually widening from below upwards. It is used chiefly for husking rice that has been threshed. Rice is threshed on the floor or in heavy logs scooped out in the shape of a boat (*lollóng̃*), and pounded or husked in the mortar by means of the *al-ó* or pestle. Generally only one person pounds rice in the mortar, but occasionally two or even three persons, each of them provided with a pestle, work together pounding the rice alternately. In case there are three, each person alternately pounds the rice and drops the pestle on the broad rim of the mortar, so that the rhythm of the performance continues unbroken.

(in)anaáw(an): A kind of *kallokóng̃* hat made of the limbs of the leaves of the *anáaw* palm (*Livistona rotundifolia*). The *inanaáwan* sometimes reaches a diameter of one yard.

anáwang̃: A kind of underground furnace used in the preparation of sugar from the juice of the sugar cane (Plate 1, fig. 2). It consists of four holes dug in the ground in a single file and communicating with one another. The foremost hole and the third are dug straight down, while the second and the last are slanting toward the third. The foremost hole or *(pag)kadkád(an)* (*a*) is the largest and is used to rake out the ashes; the second or *(pag)sung̃rúd(an)* (*b*) is used to feed the fire, generally with dried bagasse; the third or *(pag)sadáng̃(an)* (*c*) forms the real furnace and is covered by the large iron pot or *s(in)ublán*, into which the juice is poured; the fourth or *tamborán* (probably of Spanish origin) (*d*) serves as a chimney.

annang̃á: A kind of raincoat made of palm leaves (generally of the *anáaw*, *Livistona rotundifolia* Mart.), whose bases surround the neck of the wearer and whose tops spread like a fan all around the body except in front, at the height of the waist line. Ordinary raincoats are known by their Spanish name *capote*.

áng̃at: A plow with a mat or lusterless share and moldboard. Cf. *sidíp*.

ang̃uyób: Blowpipe; usually a section of bamboo consisting of several internodes. Also: either of the two iron tubes of the Iloko bellows through which the air is expelled into the fire. Cf. *yubuyúban*. The windpipe or trachea is called *ang̃-ang̃uyób*. (Plate 2, fig. 11, *b*.)

ap-áp: Cover, wrapper; layer, stratum, litter, bedding. Anything that is used to cover something, and on which, in turn, something else is placed or on which some work is done. It serves as a kind of protection either for that on which it is laid and against that which is done or laid upon it, or vice versa. Examples are: the saddle cloth, the layer of straw or hay that is laid in a hen's nest, the leaf or paper spread in a basket before meat, or some other food is placed in it, and the like. A pillow on which bobbin lace is made has two covers: a lower one or *ap-áp*, which covers the pillow immediately and over which the lace is made; it prevents any dirt that might be shed by the stuffing of the pillow from affecting the lace; an upper one or *akkúb*, which covers the whole outfit; it prevents outside dirt from affecting the lace. Cf. *akkúb* and *ápin*.

ápin: Any kind of leaf or leaves spread over the bottom of a *báñga* or earthen pot, at the inside, before the rice that has to be cooked is poured into it. The most ordinary *ápin* is a piece of banana leaf. Cf. *ap-áp*.

(pag)apúg(an): A kind of very small *báñga* or earthen jar used by chewers of betel nut for holding lime. Literally: a receptacle for lime; *ápug* means "lime," the combination *pag . . . an* is a locative. Hence: any receptacle for lime.

(pañg)arun(án): Anything very inflammable or taking fire easily, for instance, paper, pitch pine, shavings, etc., and used for starting a fire. From the stem *arún* and the locative *pañg . . . an*.

(pañg)asá(an): Whetstone, oilstone, hone. From the stem *ása*, "whetting," and the locative *pañg . . . an*.

asád: A kind of agricultural fork: a wooden implement consisting of a handle with a small board provided with several prongs or tines, which are parallel and straight; it is used, like a dibble, to make holes in the ground in order to sow rice. Rice is sown (*agbonébon*) in plots of ground carefully prepared for the purpose, before it is transplanted (*agraép*) into the rice fields. Imported forks, either agricultural forks or table forks, are known by their Spanish name *tenedor*, pronounced *tenidór*. (Plate 1, fig. 3.)

(pag)asin(án): Saltcellar. From the stem *asín*, "salt," and the locative *pag . . . an*.

assiw: Any kind of pole, mostly of wood or bamboo, used for carrying loads on the shoulder. More exactly: the pole used by a single carrier both parts of the load having been equally divided between both ends of the pole, and the latter's central part resting on the carrier's shoulder. Cf. (*paginn*)*assiwán*.

(paginn)assiw(án): Any kind of pole, mostly of wood or bamboo, used for carrying a heavy load between two persons, either extremity of the pole resting on the shoulder of one of the carriers. The combination *pag . . . an* is a locative; the infix *inn* indicates reciprocity, rivalry, etc. Cf. *assiw*.

badáñg: A kind of *bunéñg* or bolo with a pointless blade, shorter but much broader than that of the common *bunéñg*.

(pag)bagas(án): Any receptacle for husked rice, for instance, a *karámba* or earthen jar, a wooden box, or the like. Except on special occasions, such as banquets, the Iloko never pound a great quantity of rice all at once, as it tastes much better when freshly pounded; hence the quantity of pounded rice that has to be stored away is generally small. *Bagás* means "husked rice;" the combination *pag . . . an* is a locative.

begiñgét: Pincers, nippers.

(kaba)bái: The smaller of a pair. For instance: the shorter of the two rollers of a cane mill (Plate 1, fig. 5, *a*), the shorter of the two handles of a *sígot* (a kind of scoop net). Cf. *(kala)láki*. *Bái* means "female;" *babái*, "woman;" the prefix *ka* forms nouns, more especially abstract nouns.

baki: Nest. Any receptacle prepared by man for hens in which to lay their eggs and to hatch their young. An ordinary bird's nest is called *úmok*. The typical *baki* is an open-worked basket with a flat square bottom and a round rim.

bakká: A kind of earthen basin, used especially for washing and cleaning rice, fish, vegetables, and the like. Ordinary basins are known by their Spanish name *palangana*.

baláis: A bamboo attached on one side to the main roller or *kalaláki*, and on the other side to the shaft or *tañgbáw* of a cane mill. The purpose of the *baláis* is to strengthen the shaft. (Plate 1, fig. 5, *d*.)

balkút(an): Wrapper. *Balkútan* and *abbóñg* may sometimes be used interchangeably. However, *abbóñg* emphasizes the concept of "protecting," while *balkútan* is a more general term and emphasizes the concept of "wrapping up, more or less completely;" hence, *balkútan* will rarely be used with reference to living beings. From *balkút*, "wrapping," and the locative suffix *an*. Cf. also *akkúb*.

banbán: A kind of *kattokóñg* hat made of strips of *púser* bamboo (*Schizostachyum fenixii* Gamble).

bandili: A fine-toothed saw with a narrow blade and without frame. The *bandili* is simply the blade of a frame saw.

banilag: A shelf made of woven bamboo and attached to one of the tiebeams of the kitchen, in order to hold utensils and other things of use in the kitchen. Cf. *kaláwag* and *daydáy*.

bantéñg: Line, clothesline. A rope, a strip of bamboo, a wire, or the like, stretched between two fixed objects for the purpose of holding things that have to be dried, or to be exposed to the sun. Cf. *parléñg* and *salad-ayan*.

báñga: A broad-mouthed, almost spherical, vessel of earthenware with a round bottom, used for cooking rice. In well-regulated kitchens, the real *báñga* serves no other purpose. (Plate I, fig. 4.) Other earthen pots or jars: *(pag)-apúg(an)*, *burnáy*, *dañgdáñg*, *gambóñg*, *kam-áw*, *karámba*, *tá-yab*, *patík*. Kettles are known by their Spanish name *caldero*.

báñgad: Back (of a knife, a saw, or similar implement). Cf. *tadém*.

(pag)barút(an): A tool used by silversmiths to thin silver bars. It consists of a bar of iron, some 8 inches long, and pierced with a series of holes gradually decreasing in size. The sharpened silver bar is pushed into and pulled by means of pliers through each hole in succession, until it acquires the required size. *Bárut* means "wire;" the combination *pag . . . an* is a locative.

basikaw: Hoop. Made of wood.

(maysa a) bassít: ½ centavo piece. A small copper coin used in Spanish times. Literally: one small one.

batáy: Stand, support. Something on which anything may be placed for support, for instance, a contrivance of wood or bamboo on which jars, especially *karámba*, are placed; stones or pieces of wood on which timber is placed to prevent the latter from coming in contact with the ground and being destroyed by white ants.

báut: Stick. A slender piece of wood, much thinner than the *pan̄gór*, used for whipping.

bayen̄gyén̄g: A thick section of bamboo, consisting of several internodes and used for carrying liquids, rice, or some other burden; more especially, water. Cf. *potón̄g*.

ben̄gbén̄g: Curtain. Any kind of cloth used as a hanging screen and intended to darken, conceal, protect or be ornamental, usually admitting of being drawn back or up at pleasure, for instance, when there is a sick person in the house and he cannot have a separate room, a movable screen for concealing the stage, pieces of cloth used to ornament the stage, the altar, or for similar purposes. A mosquito net is called by its Spanish name *mosquitero*.

beitád: A kind of sledge or sledge hammer, with a head about twice as large as the *dón̄gsól* or ordinary blacksmith's hammer.

bették: Band, tie, string. A strip of bamboo, a vine, or the like, used to bind reaped rice into bundles.

bigáo: Winnow, winnowing basket, or fan. The *bigáo* is woven closely, rather large, very shallow, and oval in shape, with one end broader than the other; it is used to winnow pounded rice.

binlín̄g: The weight of twenty-five copper 1-centavo pieces. A silversmith's term. *Binlín̄g* also means "a value of 25 centavos."

(bitin)bítin: Either of the scales or pans suspended from a balance. *Bítin* means "suspending;" the reduplication indicates similarity or repetition of an action.

(pam)ugbúg(an): Any receptacle (a *bán̄ga* jar, a can, or the like), used for holding remnants of food, parings, water in which rice has been washed, or whatever may be used as food for hogs, dogs, and other domestic animals. *Bugbúg* means "reducing to pulp;" the combination *pan̄g . . . an* (final *n̄g* of prefix combined with initial *b* of stem into *m*) is a locative.

boligengén: A small basket resembling a *yakáyak* sieve, but closely woven like the *bigáo* winnow, and used for holding small objects for sale, for instance, small bundles of ready-made betel nut.

bunén̄g: Bolo. A kind of large, single-edged knife, resembling a machete, which is a large heavy knife resembling a broadsword, often two or three feet in length. Cf. *badán̄g*.

burnáy: A kind of vase or jar, a deep strong broad-mouthed vessel of earthenware, rounded, with a flat bottom, and usually of greater depth than width. It is commonly used to hold water for cleaning purposes, but several commodities, as sugar, *básí* (an alcoholic beverage made from sugar cane), and the like, are very often sold by the *burnáy*. (Plate 1, fig. 6.) Cf. *bán̄ga*.

buyúbuy: A kind of cup, which consists of about one-half or two-thirds of a coconut shell, thoroughly cleaned and fit to be used as a dipper, a drinking cup, or for a similar purpose. In some districts it is called *ún̄got*. Cf. *dúyog*. Ordinary glasses are known by their Spanish name *vaso*, pronounced *báso*.

dagsén: Weight, as a definite mass of iron, used for ascertaining the weight of other bodies.

dalikán: Hearth. Any kind of hearth; more especially: a portable earthen contrivance, more or less in the shape of a cradle, with a flat bottom, and three hornlike projections (*pagsadiñgan*) at one end, upon which are placed the jars used in cooking; the other end (*dapogán*) forms a receptacle for ashes.

damortis: Cf. *lótiam*.

(da)dapil(an): Sugar mill. A machine with rollers for pressing out the juice of the sugar cane; it is generally moved by a carabao attached to the end of the *tañgbáur* beam and walking in a circle. (Plate 1, fig. 5.)

dapó: Ashes.

dapogán: The part of the *dalikán* or hearth adjoining the *pagsadíñgan*, and used as a receptacle for ashes. Derived from *dapó*.

dárusdús: A kind of thrust hoe, scuffle hoe, or Dutch hoe, used for weeding. The *darusdús* is straight and consists of a wooden handle, between one and two feet long, and a flat, comparatively broad iron blade.

dayóday: A contrivance of wood, bamboo, or similar material, set horizontally on a wall at a distance from the floor, to hold mats (*ikámén*), pillows (*puñgán*), and other bedding. The *dayóday* either forms a shelf or consists of two or more bars projecting from the wall at a certain distance from one another.

dikén: Pad. A circlet, made of cloth, and used by women to place on their head when carrying a load, in order to steady the latter and to avoid its immediate contact. The central space of the *dikén* is smaller than that of the *sagapá*.

(pa)díla: The end of a wooden haft, handle, or helve that fits in an iron socket (Plate 2, fig. 10, *c*). *Díla* means "tongue," the prefix is an instrumental.

(pa)dná: A piece of rope with one end fixed in the nasal septum of a carabao and the other attached to the rope proper. The *padná* is much longer than the *(pa)rúñgo* and passes beyond the animal's horns. From the stem *diná*, "adjoining," and the instrumental prefix *pa*.

diñgdíñg: Moldboard (of a plow). The moldboard and the share (*sulsúb*) are the only pieces of an Iloko plow that are made of iron, all the rest is made of wood. (Plate 2, fig. 10, the moldboard does not appear.)

doñgdóñg: A kind of very large *bánga*, used for cooking rice, stewing meat, and for similar purposes.

doñgsól: Blacksmith's hammer. Cf. *bettád*. Ordinary hammers are known by their Spanish name *martillo*.

dúlañg: Table. Native tables are very low, and persons sitting at them cannot use chairs but must simply squat or sit on the ground and occasionally on a small low stool. Ordinary tables are called *lamisáan*, from the Spanish *la mesa*, "the table", and the locative suffix *an*.

(pa)dúlañg: Pulverizer, a device for pulverizing the soil. *Dúlañg* means "table," the prefix is an instrumental.

dúyog: A kind of saucer or small dish, which consists of about one-fourth of a coconut shell, thoroughly cleaned and fit to hold viands (not rice), condiments, and the like, at meals. Rice is placed in wooden plates called *látok*, one for each individual. Cf. *bugúbog*. Ordinary saucers are known by their Spanish name *platito*.

gabión: A kind of grub hoe, chiefly used to dig the ground.

gadgád(an): A kind of rough whetstone, used to smooth spindles, and for similar purposes.

gálut: Cf. *sin̄gdán.*

gambón̄g: A kind of large *karámba,* about three or four times as large as an ordinary one.

garugád: File.

gerrét: A kind of blacksmith's chisel with a long handle, used for grooving hot iron. The *gerrét* is driven by a hammer.

gesgés: A kind of heavy lumbermen's two-handed saw, used for felling trees. Its blade has the same width all along and its teeth point in an opposite direction on both halves of the blade. Cf. *kíkir* and *ragádi.*

gettén̄g: Scissors, shears. Cf. *kartíb.*

gibak: Potsherd. A piece or fragment of a broken earthen vessel, like a *bán̄ga* or *karámba.* A *gibak* is much thinner than a *ribak.*

gilin̄g(an): Corn mill. Two flat stones used for grinding Indian corn by rubbing and crushing; the lower stone lies on the ground and the upper one is provided with a handle.

íben̄g: The main body of the Iloko bellows into which the air is drawn: it consists of a hollow piece of earthenware resting on the ground and provided at one of its sides with two iron tubes or *an̄gnyób* through which the air is expelled into the fire. The two hollow cylinders through which the air is drawn into the *íben̄g* rest on the latter's upper surface. Cf. *yubuyúbon.* (Plate 2, fig. 11, *a.*)

igad: Coconut scraper. An instrument used for scraping out the meat of coconuts. It generally consists of a heavy block of wood resting on the ground or preferably on the edge of a chair and provided with an upward projection terminating in a toothed iron blade.

ikamén: Mat. A coarse fabric made by weaving strips of the leaves of the screw pine (*Pandanus* sp.), strips of the petioles of the *silag* or buri palm (*Corypha elata* Roxb.), or similar material, and universally used to sleep upon. On arising it is rolled up together with pillows and blankets, and placed on the *dayéday.* Beds are known by their Spanish names *catre, cama.*

imokó: Knife. The *imokó* is a diminutive *bunén̄g.* Ordinary knives are known by their Spanish name *cuchillo.*

in̄gát: Toothpick.

(pa)ipit: Vise; for instance, the carpenter's wooden vise, the parallel swivel bench vise. *Ipit* means "chela" or "pincers of crustaceans;" the prefix is an instrumental.

(pag)kadkád(an): Ash pit. The part of the *adúwan̄g* furnace where ashes are collected and whence they are ultimately drawn to be thrown away. (Plate 1, fig. 2, *a, a.*) *Kadkád* means "raking embers;" the combination *pag . . . an* is a locative.

kaláwag: A shelf made of timber or bamboo, to hold dishes. Cf. *banílag* and *dayéday.*

kallogón̄g: Hat. A general term. Cf. *(in)anodáwan, bambán, kallokón̄g,* and *kopia.*

kaloát: A kind of tray generally made of woven bamboo or rattan and suspended from the ceiling, the roof, or a *bekkér* tiebeam, to keep articles of food out of the reach of rats, cats, dogs, etc.

kalúb: Cover, lid. Cf. *akkúb.*

kalúb(an): Sheath, scabbard. A wooden case for a *bunén̄g* or bolo. The *kalúban* generally covers the blade of the *bunéng* completely on both sides.

kalúlot: Ferrule. A metal ring covering the end of the hilt of a bolo, a knife, or a similar implement, where the tang of the blade is inserted.

kam-áw: A kind of very broad-mouthed rather strong earthen vessel, resembling an ordinary flower pot and almost identical with the lower half of a *burnáy;* it is chiefly used for holding lard.

kammadáng: A kind of baboosh or babouche with a thick wooden sole and a comparatively high heel, used in rainy weather. The ordinary baboosh, which is a kind of Oriental slipper without heel or quarters is known by its Spanish name *chinela.*

karámba: A board-mouthed earthen vessel, very much resembling a *dongdóng bánga,* and used to hold water for drinking purposes.

(pagka)karambá(an): A stand or support for *karámba* jars, usually made of woven rattan. The combination *pag . . . an* is a locative, and the reduplication emphasizes the meaning.

kartib: Scissors, shears. Cf. *getténg.*

karuás: A kind of skimmer. It resembles an ordinary vegetable ladle (cf. *akló*), but, instead of being provided with a wooden blade, it has one made of open-worked woven rattan or bamboo.

kárus: Scraper. Anything that can be used to scrape out the meat of coconuts, or to scrape papaws or papayas into shreds for salad; for instance, a potsherd, a piece of a coconut shell, etc. The *kárus* is larger than the *kirús.* Cf. also *ígad.*

katám: Plane, joiner's plane; for instance, the wooden jack plane, or the wooden trying plane.

kátoy: A kind of small silversmith's hammer with a head made of horn.

kattokóng: A kind of hat, either consisting of the outer shell of the rounded part of a bottle gourd, or woven from strips of bamboo, from rachises of climbing ferns (*Lygodium* sp.), or the like. Its upper surface is rounded throughout, and the crown is not differentiated from the brim; consequently the *kattokóng* more or less resembles an overturned basin. It fits the head by means of a folded band (*liñgkó*) of woven rattan, bamboo, or the like, placed inside at the center, and it is usually kept in place by means of a chin strap (*paratínid*). Cf. *kopia.*

kaykáy: Outdoor broom. Any contrivance used to sweep houseyards, streets, etc. Cf. *ságad.*

kellêb: A cover for an earthen jar, *bánga, karámba,* and the like. The *kellêb* consists of a perforated section of a coconut shell (*surúsur*) provided with a wooden knob at the center of its convex side, which remains uppermost. Cf. *kalúb.*

kíkir: Saw. Any kind of saw that can be handled by a single person, for instance, a ripsaw or a small frame saw. Cf. *gergés* and *ragádi.*

kiráod: Any cuplike implement used to draw rice, liquids, or other substance from a receptacle; for instance, a cup, a can, or a tin. This term is chiefly used as a measure (*sangkakiráod,* "one cupful"), and more or less corresponds to the Spanish *chupa,* the eighth part of a *salúp* or *ganta* (three liters). A *kabán* (Spanish *cavan*) holds 25 *salúp* or 75 liters.

kirús: Scraper. Anything that can be used to clean a pot, a pan, or other utensil to which some extraneous matter is sticking; for instance, a potsherd or a piece of coconut shell. The *kirús* is smaller than the *kúras*.

kollóoñg: Trough. A large vessel, long and comparatively shallow, used to hold fodder for swine. It generally consists of a heavy log, hollowed out in the shape of a boat. A somewhat larger *kollóoñg* is used to separate rice from the stalk by means of the *al-ó* or pestle, before it is pounded in the *alsóñg* or mortar. The same name is actually applied to the crib or manger in which Jesus was laid in the stable at Bethlehem.

kompáñg: The receptacle of the *saíñgan* lamp. Also: a small receptacle made of heavy bamboo and used by silversmiths to hold metals that have to be melted; in order to obtain this result the operator blows fire over the metal in question.

kompáy: Sickle. The *kompáy* has a toothed blade.

kopía: A hat with a crown and brim, made of woven strips of the petiole of the *silag* or buri palm (*Corypha elata* Roxb.). Cf. *kallogóñg*.

koppít: A kind of *upít* basket, used to hold provisions, implements, and the like. It differs from the ordinary *upít* in being about twice as high. *Koppít* also means "flat, flattened."

koribatóñg: Plumb bob, plummet. Cf. *timnág*.

kotkót: Grooving plane, rabbet plane.

kulúkul: Gimlet, auger.

kuribut: A kind of basket similar to the *alát*, but much larger, sometimes more than one yard high. It is used for holding salt, cotton, and the like.

labbá: A kind of basket with a square bottom and a round rim. The *labbá* resembles the *rañgáya* in all particulars, but is much smaller, its diameter at the rim being generally less than one foot. As this is perhaps the most common basket known by the Iloko, *labbá* is often used as a general term for all baskets.

ladáwan: Image, statue, picture, portrait, print, photograph, painting.

(kala)láki: The larger of a pair. For instance, the longer of the two rollers of a cane mill, the longer of the two handles of a *ságot*. Cf. *(kaba)bái*. *Láki* means "male;" *laláki*, "man;" the prefix *ka* forms nouns, more especially abstract nouns. (Plate 1, fig. 5, *b*.)

lálat: Leather.

(pag)lana(an): Oiler, oil can. *Lána* means "coconut oil;" the combination *pag . . . an* is a locative.

lánañg: Solder.

lañgdét: Chopping block. It usually consists of a thick board of hardwood.

(lapot)laput: Automatic hand drill. The Spanish term *barrena*, for any kind of drill or brace, is used much more extensively.

látok: Wooden plate. Only rice is eaten from the *látok*. Cf. *dúyog* and *piñggán*.

lidiñg: Ring. For instance, a ring of bamboo or coconut shell that is fixed in the nasal septum of a carabao and to which the rope is attached, a metal ring fixed in the snout of swine to keep them from digging up the ground, or the like.

lidlid: Polishing iron, burnisher. The *lidlid* of the Iloko silversmith is simply a curved piece of wire; it is dipped in a mixture of soap and other ingredients before it is used to burnish precious metals that have been previously smoothed and polished with a file.

likidan: A kind of rolling pin, consisting of a cylindrical piece of wood, about as big as a finger, and used by silversmiths to roll metal into cords or strings. The *likidan* is repeatedly pushed over the metal, away from the operator.

likup: Scooper. A chisel with a scooplike blade.

linas: Cf. *siñgdán*.

liñgáliñg: A kind of portable screen, consisting of a large sheet of woven bamboo, and used by harvesters to cut off the rays of the sun. It rests on the ground with one end and is kept upright in a slanting position by a prop, generally a bamboo.

likgéd: A band of woven rattan, bamboo, or similar material, fixed in the center of the *kattukóñg* hat, at the inside, to fit the head of the wearer. This band is folded and turned into a ring of the desired size; both its borders are applied to the hat, while the convex side remains undermost and next to the head of the wearer.

(pa)lítik: A kind of marking line consisting of a long string covered with wet soot and used by sawyers and carpenters to mark timber. This string is terminated at one end by an iron point (generally fixed in a small wooden handle), which is driven in the log or piece of timber a little below the surface that has to be marked, while at the other end it is pressed by the operator against the same surface usually with the index of his right hand; then with the hand that remains free the stretched line is lifted up somewhere at the center and immediately allowed to fall down again into its normal position, once, twice, or oftener, until it leaves a straight black mark all along. This string is generally attached to a kind of pulley consisting of a piece of wire and kept in the back compartment of a double wooden boxlike contrivance without lid, a small wooden handle being fixed to the same pulley at the outside through a hole in the side of the box. After the marking is done the operator turns the handle in order to wind the string on the pulley inside the box, where it first passes through the front compartment, in which is stored some coconut husk saturated with soot. The string passes through two holes, one in the front side of the box, and one in the partition, whenever it is wound or unwound, but the aforementioned iron point keeps it from passing through completely when it is wound up. The string is blackened most effectively by pressing it lightly against the coir in the front compartment of the box with a small stick, whenever it is unwound for a new marking. From the stem *lítik*, "hole in a jar," and the instrumental prefix *pa*. (Plate 2, figs. 7 and 8.)

lótiaw: A mold used by silversmiths for a kind of ear pendant called *damortis*. The *damortis* is a tree (*Pithecolobium dulce* Benth.), and also the fruit of this tree, namely a large, turgid, curved, mostly spiral pod, the shape of which is reproduced in the aforementioned ear pendant. This term is probably not genuine Iloko.

lúbid: Cf. *siñgdán*.

mallokóñg: A very large earthen cup without a handle.

múlo: A kind of wooden beetle for beating clothes that are being washed. The *múlo* is entirely straight and hewn from a single piece of wood; its head is more or less oval-shaped and flat.

mayéá a basít: Cf. (*mayéá a*) *basít*.

(pag)nasnás(an): A piece of cloth, a towel, or a rag used to rub something; more especially: the rag on which a flatiron is rubbed before it is used to iron clothes. From the stem *nasnás*, "rubbing with a cloth," and the locative combination *pag . . . an*. Cf. *nisnis* and *(pag)punás(an)*.

nisnis: A piece of cloth, a rag, or the like, used to take hold of pots and pans over the fire, to wipe them when dirty, and for similar purposes. The *nisnis* is used to wipe objects that are liable to dirty it, while the *(pag)punás* is used to wipe objects that will not dirty it, but only wet it at the most, for instance, washed plates, the body after a bath, etc. Cf. *(pag)nasnás(an)* and *(pag)punás(an)*.

óñgot: Cf. *bayábay*.

osáos: A small bowlike contrivance used by silversmiths to clean and polish rings, ear pendants, etc. The *osáos* consists of a small wooden arc with a string, attached at one end to one of the points of the arc, and loose at the other end. The string is first rubbed in a kind of dust obtained from smashed potsherds, and then the object that has to be polished is rubbed over the string. The silversmith takes hold of the free point of the wooden arc and of the free end of the string, with one hand, and with the other, he rubs the ring or other object to be polished over the string, up and down. In this manner most jewels are cleaned thoroughly, inside and outside.

otéñg: Tang, tongue. Of a knife, a bolo, or a similar implement.

padúl: The peg to which animals are attached by means of a rope. The *padúl* is stuck in the ground and the projection above ground is comparatively small.

paét: Chisel.

paid: Fan. A small sheet of woven bamboo, a piece of cardboard paper, or the like, used for fanning the fire, in ironing clothes, roasting meat, and the like. Cf. *paypáy*.

palloká: Sandal. The *palloká* consists of a leather sole strapped to the great toe.

pandarás: Adz, carpenter's adz.

pandéñg: The vertical piece of wood that sustains the shaft or *tañgbáw* of a plow and rests on the *patán*. (Plate 2, fig. 10, *d*.)

pañg-ár: Club, cudgel.

pápag: A kind of bench or bed made entirely of bamboo. The legs and frame consist of round sections of bamboo; the seat or bed consists of woven bamboo or more commonly of more or less narrow strips of bamboo tied together (*inaklilis*) with strips of rattan, like the *básar* or *datár* of the floor of the house.

paratimid: Chin strap. A rope or string attached to both sides of a *kattokóñg* hat and passing under the chin of the wearer. From the Spanish *para*, "for," and the Iloko *timid*, "chin."

parióк: An iron pan with a round bottom and a short iron handle in the shape of a socket. Pans with flat bottoms are known by their Spanish name *sartén*, often pronounced *sartin*. Cf. *siliási* and *s(in)ublím*.

patéñg: Line. A cord, a wire, a strip of rattan, a bamboo, or the like, used in leveling and as a guide when making fences, roads, or the like. Cf. *batéñg* and *rukód*. Probably from the instrumental prefix *pa* and some unknown root or stem (*rettéñg?*). *Irteñgén* means "to stretch."

pasnáan: Anvil. Probably from the locative combination *pa . . . an* and some unknown stem or root (*sána?*

not sennú, as in this case the word should be accented *pasnaán*).

pátay: Cf. *batáy*.

patilambó: Platter. A large round plate or dish made of coarse earthenware. Modern platters are known by their Spanish name *bandeja* (sometimes called *bandehádo*).

páyoñg: Umbrella, parasol.

paypáy: Fan. An instrument for cooling the person. Very often called by its Spanish name *abanico*. Cf. *paíd*.

pigad: Anything placed near an entrance to rub off dirt from feet or shoes; for instance, the husk of a coconut, corncobs, a mat, a rag, or a scraper.

piiñg: A kind of pliers used to straighten the teeth of a saw. It consists of a piece of wire split at one end.

piñggán: Plate. Any kind of plate except the *látok*.

piñgki: Flint and steel. For striking fire.

p(in)iwir: Old-fashioned ear pendants. The *piniwir* consists of a solid ring of precious metal with a gap that cannot be widened or shut.

porsisiáw: Silversmith's solder. Of doubtful Iloko origin. Cf. *lánañg*.

potóñg: An internode of bamboo used for holding water, etc. Cf. *bayoñgyóñg*.

(pag)punás(an): Napkin. *(Pag)púnas* means "towel"; for instance, a dish towel or a bath towel. Cf. *(pag)nasnásan* and *nisnis*. *Púnas* means "wiping;" the prefix *pag* is an instrumental; the combination *pag . . . an* is a locative.

puñgán: Pillow, cushion.

pután: Handle (of a knife), haft (of a sword), helve (of an ax), shaft (of a spear), shank (of a pipe), the part of a plow at the end of which is fixed the share, or the blade. (Plate 2, fig. 10, *c*.)

putík: A kind of small *burnáy*, whatever be its color and whatever its contents.

ragádi: A kind of large two-handed frame saw used for sawing logs. Its rather slender blade has the same width all along, and the teeth of each half of the blade point away from the center. Cf. *gragás* and *kikir*.

rakém: Reaper's knife. The *rakém* consists of a small wooden handle and a small blade stuck in crosswise at some distance from the top, with the back toward the handle. Plate 2, fig. 9. It is used to cut rice below the ear. The reaper takes hold of the *rakém* in the palm of his hand, with the index above and the three other fingers (thumb excluded) below the blade.

rañgáya: A kind of basket with a square bottom and a round rim. Like the *labbá* and the *allúdan*, the *rañgáya* is made of narrow strips of *píser* bamboo (*Schizostachyum fenixii* Gamble). The foot is surrounded by a strong broad strip of bamboo, while the border is pressed between two almost equally broad strips. All the rest is smooth and even, outside and inside. The *rañgáya* is at least twice as large as the *labbá*, and larger than the *allúdan*.

ribak: Potsherd. A piece or fragment of a broken *burnáy*, *kamáw*, or the like; the same name is applied to thin bricks. The *ribak* is much thicker than the *gíbak*.

(ag)rukieb: To enter the ground, to be situated underground. For instance, all parts of the *andúwañg* furnace.

rukód: Line, rod; tapeline, tape measure, yardstick, meter. A cord, a wire, a strip of rattan, a bamboo, or the like, used in measuring. Cf. *bantéñg* and *partéñg*.

(pag)saáñg(an): The support on which is placed a cooking vessel, like a jar, or a pan, when put on the fire; for instance, three upright stones, the three horns of a *dalikán*, the part of the *anáwañg* furnace over which is placed the *sinublán* pot. From the stem *saáñg*, "putting on the fire," and the locative combination *pag . . . an*. (Plate 1, figs. 2, *c*, c_1.)

(sa)sab-it(an): Rack, peg, nail; hanger. Any projecting device to hold clothes or hats. Also: any of various hanging or depending devices for supporting something, as a chain, a rope, or the like, by which a lamp, a pot, or any object, is suspended. *Sab-it* means "hanging," "suspending;" the suffix is a locative; the reduplication emphasizes the meaning.

ságad: Broom. An implement for sweeping floors. Cf. *kaykáy*. Common brooms are made of the panicles or tops of *buybúy* grass (*Thysanolaena maxima* O. Kuntze) bound together.

sagapá: Pad. A circlet, made of cloth, wood, straw, or the like, on which jars with a round bottom, for instance, a *báñga*, *karámba*, etc., are placed. *Cf. dikén.*

sagát(an): Strainer, filter, colander. The most primitive strainers consist of a piece of *sinamáy* cloth (made from the fiber of the *abacá* or Manila hemp). *Ságat* means "filtering" or straining; the suffix is a locative.

sagaysáy: Comb. Used for adjusting, cleaning, and confining the hair, or for adornment.

sag-út: Cf. *siñgdán*.

saíñg(an): Old-fashioned lamp. Any kind of small vessel (*kompáñg*) filled with oil in which swims an ordinary wick, made of twisted cotton yarn and resting on the rim of the vessel.

salad-áy(an): Anything on which something (clothes, etc.) is hung, to dry, for example, as a clothesline, or the back of a chair. Cf. *bantáñg*.

salapay(án): Cf. *salad-áyan*.

sallúy(an): A rope, a stalk of bagasse or the like, used to support and move long and slender objects by dragging them along the ground. The bagasse is generally moved that way.

sañggá: The collar or flange surrounding the base of the blade of a knife or holo, and used to prevent it from entering deeper into the handle.

(pag)sañggá(an): Saucer. A small earthen dish in which a cup or a glass containing liquids is set. Cf. *sañggá*. The combination *pag . . . an* is a locative. Cf. *dúyog*.

(pa)saratsát: An implement of agriculture very much resembling a harrow, and formed of pieces of timber crossing each other and set with iron knives, usually sixteen, in four rows. It is drawn over land to cut tall weeds and grass, immediately before plowing. *Saratsát* means "disemboweling," "eviscerating," "unseaming," 'ripping;" the prefix is an instrumental.

(pag)sarmíñg(an): Mirror, looking-glass, speculum. From the stem *sarmíñg*, "glass," and the locative combination *pag . . . an*.

(agkai)saroombíñgit: Cf. *saroñggáñgat*.

saroñggáñgat: A small section of bamboo, about 2 inches long, with one end cut into sharp points all around, and strung on the rope of a carabao, between the terminal knot and the nose. When the driver pulls the rope the pointed edge of the *saroñggáñgat* pricks the nasal septum of the animal. This device is used only with carabaos that are not easily manageable. *Aglaisaroñggáñgat* means "to lay around," "to be in a scattered position," "to be strewn all over the floor," etc., and is said, for instance, of garments, clothes, paper, thorns, or pins (on a pin cushion). *Aglaisarombiñgit* has the same meaning, but cannot be said of thorns, pins, or the like.

(pag)saruno(án): A long supplementary rope attached to the ordinary rope of a carabao, and used, for instance, in plowing, to direct more easily the movements of the animal. *Sarunó* means "following," "coming next;" the combination *pag...an* is a locative.

saud(án): A curved piece of wood resembling a *páko* or yoke, and attached to the fore end of a plow, at the end of the *tañgbáw* pole. Both *gayúdan* ropes are attached at one end to the real yoke and at the other end to the *saudán*. (The *saudán* is not marked in Plate 2, fig. 10).

sawsit: A very small cup without a handle, used chiefly to measure *boggóong* (a kind of preserved fish, fermented and liquid).

sekkár: The *sekkár* is identical with the *kolálot* except that it is made of woven strips of bamboo, and that it is also used to bind together the parts of a broom, or the like. Cf. *ságad*.

(pag)seldán(an): Any kind of vessel, as a *burnáy* or a large can, used to hold water for cleaning (not drinking) purposes.

sipit: Clip. A clasp or holder for letters, or the like.

sikápat: Half a *bintiñg*. Cf. *bintiñg*.

sikawaló: Half a *sikápat*, one fourth of a *bintiñg*.

siko: Try-square. More often called *eskuála*, from the Spanish *escuadra*. *Siko* also means "elbow."

sikráoñg: A kind of large bag made of strips of heavy bamboo tied together (*inakilis*) with rattan, and used to carry *burnáy* jars, especially those filled with *bási* (an alcoholic beverage obtained from sugar cane). A pole is pushed through the *sikráoñg* over the *burnáy*, and the whole outfit is carried by two men.

siláp: A plow with a glossy share and moldboard. Cf. *áñget*. A plow, in general, is known by its Spanish name *arado*.

(pag)siláw(an): Lamp. From the stem *siláw*, "light," and the locative combination *pag...an*.

siliási: A kind of large iron pot with a round bottom. The *siliási* is identical with the *periók*, except that it has no handle and that it has a diameter of from 2 to 3 feet at the rim. It is used for cooking meat in large quantities, for making lard, and the like.

siñgdán: String, attachment. A string, a vine, a strip of rattan, or the like, by which one thing is attached to another in order to prevent the former from running away or falling down. The *siñgdán* usually leaves a certain distance or space between both objects, while the *gálot* connects them immediately. The term *gálot* emphasizes the concept of "binding," while the term *siñgdán* emphasizes that of "attaching." Both *siñgdán* and *gálot* may consist of a string, a vine, a strip of rattan, or the like. The string or strip of rattan by which a hog, a rooster, or some other animal, is attached to a pole is called *siñgdán*; the string or strip of rattan by which the outer part of a shelf is attached to the wall or ceiling is also called *siñgdán;* the strips of rattan that bind together the parts of a fence are called *gálut.* When the attachment that serves the purpose of a *siñgdán* is much thicker than a string, a vine, or a strip of rattan, it is called *táli,* for instance a rope, or a long strip of carabao hide. The *táli* may also serve the purpose of a *gálut,* but in this case it means "rope," to distinguish it from a *gálut* of other material or size: the rope of a horse is called *táli* (never *siñgdán*); the rope that binds together two heavy logs is called either *táli* (material) or *gálut* (use). Strings of smaller size than the *táli* are the *línas* or *lúbid* (string) and the *sinúlit* (thread); both may be used either as *siñgdán* or as *gálut* (the *sinúlit* is used more especially for sewing). The difference between the terms *línas* and *lúbid* is very slight, and they are often used almost synonymously, at least when the material is considered and before these strings serve a definite purpose. Strictly speaking the *lúbid* is finer and generally less strong than the *línas.* When these terms refer to strings that serve a definite purpose, leaving the material out of the question, the difference is much more emphasized: the *lúbid* more or less corresponds to the *siñgdán,* leaving a certain distance or space between two objects, while the concept of *línas* is nearer to that of *gálut.* The string by which a kite is attached or kept in the hand is called *lúbid* (never *línas*); the string used to keep together the contents of a package wrapped in paper is a *línas* (not a *lúbid*). *Sag-út* is cotton yarn used for weaving, and it may serve the purpose of both the *siñgdán* and the *gálut,* and also that of both the *lúbid* and the *línas.* Consequently: *siñgdán, gálut, táli, línas,* and *lúbid* refer to the purpose for which they are used; while *táli, línas, lúbid, sinúlit,* and *sag-út* refer to material or size.

Siñgdán: used to attach one thing to another, whatever its material, small size (for instance, a vine, or a strip of rattan; *línas, lúbid, sinúlit, sag-út*).

Gálut: used to bind, whatever its material or size (for instance, a vine, or a strip of rattan; *táli, línas, lúbid, sinúlit, sag-út*).

Táli: 1. (*a*) used to attach one thing to another, whatever its material, large size (a rope, a strip of carabao hide, or the like); (*b*) used to bind: rope.
2. rope.

Línas: 1. used to bind: string.
2. string, almost synonymous with *lúbid.*

Lúbid: 1. used to attach one thing to another: string.
2. string, speaking strictly, a little finer and less strong than the *línas.*

S(in)úlit: thread (for attaching, binding; more especially, for sewing).

Sag-út: cotton yarn (for attaching, binding; more especially, for weaving).

siñgsíñg: Ring.

sipít: Tongs, forceps.

sobók(an): An iron bar used as a swage for shaping the *kalúlot* collar. The *sobókan* tapers toward an obtuse point and has four angles, two of them sharp and two obtuse and a little rounded, so that a cross section would show a more or less lozenge-shaped figure.

sódo: A kind of ladle or dipper consisting of a cuplike section (mostly one half of a coconut shell) provided with a handle, and used to dip water. *(Pag)táko* is a general term for any hollow vessel used to dip liquids. Imported ladles made of earthenware are also called *pagtáko*, but sometimes, especially when taking the place of the *akló*, they are known by their Spanish name, *cucharón*. Ordinary spoons are called *cuchara*, teaspoons, *cucharita*.

soklád: Spade, shovel, scoop. The blade is either wood or metal. The ordinary shovel is better known by its Spanish name *pala*.

(pag)sokog(án): Mold.

sonsíki: An iron bar used as a swage by silversmiths for flattening or evening the inner or outer surface of a ring, an ear pendant, or a similar object, that has become uneven, for instance, through inward or outward projection of one of its borders. The *sonsíki* has a deep narrow longitudinal groove at one of its ends; the object in question is thrust into this groove. This term is probably not genuine Iloko.

(pa)sóñgo: A piece of rope with one end fixed in the nasal septum of a carabao and the other attached to the rope proper. The *pasóñgo* is much shorter than the *(pa)dná*. From the stem *sóñgo*, "snout," and the instrumental prefix *pa*.

suál: A kind of small spade or hoe used for digging and weeding. The *suál* is straight and consists of a wooden handle and a narrow iron blade of about one foot long, broadened, and flattened at the edge, where it takes more or less the shape of the end of an ordinary crowbar. The handle of the *suál* fits in the socket of the blade, while the blade of the *darusdús* generally enters the handle by means of a tang; besides, the blade of the *darusdús* is usually broad and flattened throughout, and its shape is very variable.

s(in)ubl(án): A very large *siláui* pot chiefly used for cooking the juice of the sugar cane.

subsúb: Share, plowshare. (Plate 2, fig. 10, *a*.)

(su)sudi(án): Touchstone, Lydian stone, basanite. *Súdi* means "luster;" the suffix is a locative; the reduplication emphasizes the meaning.

s(in)úlit: Thread. Cf. *siñgdán*.

(pag)suñgrúd(an): The part of the *andáuañg* furnace into which the fuel is thrust. (Plate 1, fig. 2 *b*.) *Suñgrúd* means "fuel," "feeding the fire;" the combination *pag ... an* is a locative.

surúsur: A shallow vessel made of the part of a coconut shell which is perforated and through which the shoot finds its way when sprouting. The *surúsur* is used in the manufacture of the *kelléb*, and in washing the hair with a mixture of ashes of burnt rice straw and water, the strongest part of the ashes (too strong for the purpose) escaping through the hole or holes as soon as water is added to them.

(pag)suúr(an): A kind of large open-worked shelf or tray usually made of bamboo and suspended immediately over the fire. It is used to dry paláy (rice), wood (fuel), etc. *Súur* means "smoking;" the combination *pag ... an* is a locative.

taddó: A large round contrivance used for holding small objects, as rice, coffee, and the like, that have to be dried in the sun. The *taddó* is identical with the *bigáo* winnow in every particular, except that it is completely round and usually much larger.

tadém: Edge. The cutting side of the blade of a knife, an ax, or a saw. Cf. *bán͠gad*.

tagay(án): Cup. Cups are better known by their Spanish name *taza*, pronounced *tása*.

takará: A shallow round basket, as big as an ordinary plate, and used for holding small objects of daily use, as betel nut, or bobbins. The foot of the *takará* resembles a *dikén* and is made of the ribs of the leaflets of coconut leaves; this foot is entirely different in shape, size, and texture from the rest of the basket, and both are woven separately.

takkúb: Cf. *akkúb*.

(pag)táko: Dipper. Cf. *súdo*. From the stem *táko*, "dipping," and the instrumental prefix *pag*.

tali: Cf. *sin͠gdán*.

tampipi: A kind of large rectangular basket with flat sides. The *tampipi* consists of two parts of unequal size, the larger one serving as a cover to the other, and is used to hold clothes, provisions for the journey, or the like. It takes the place of our trunks, but is much lighter and, consequently, especially suitable for traveling. Ordinary chests or trunks, made of wood or other material, are called *bául* (from the Spanish *baul*, "a kind of chest") or *lakása* (from the Spanish *la casa*, "the house"). Boxes are known by their Spanish names *cajón*, *caja*, *cajita*, according to their size.

tampók: Whatever is set in a ring, a scarfpin, or other trinket (the setting), as a gem or a pearl, whether precious or not.

tan͠gátan͠g: A kind of shelf, convex underneath, made of laths of bamboo tied together with strips of rattan, and used to hold jars, pans, and the like. The same term is sometimes applied to the *kaluát*. *Tan͠gátan͠g* also means "sky."

tan͠gbáw: Beam, shaft. Of a plow, or a sugar mill. The pole to which the animal is attached. The *tan͠gbáw* of a plow is sustained by the *pandén͠g* (Plate 2, fig. 10, *b*); the *tan͠gbáw* of a sugar mill is fixed in the *kalaláki* roller (Plate 1, fig. 5, *c*).

táyab: An earthen vessel used for cooking fish, vegetables, or other food eaten with rice. The *táyab* is identical with the *bán͠ga*, except that its mouth is much wider.

tenneb(án): A receptacle for holding water, used by smiths for tempering the edge of cutting instruments. It generally consists of either of the two parts into which a section of bamboo has been split longitudinally.

teppén͠g: A kind of *dáyog*, used for measuring rice. Like the *kirdod*, it more or less corresponds to the eighth part of a *salóp* or *ganta* (3 liters).

tiáni: Pliers. The jaws of the *tiáni* are rounded.

timben͠g(án): Scales, balance (with two scales or pans).

tinnág: Plumb line. The plumb bob or plummet is called *koribotón͠g*. *Tinnág* also means "falling."

tin͠gál: A prop or wedge placed, for instance, under one of the legs of a table, to prevent it from moving.

tob-ók: A kind of blacksmith's punch, used for making holes in iron plates. The *tob-ók* consists of a stick of wood or bamboo with a sharp piece of iron attached sideways very near the top, in the same way as the blade of the *rakém* is attached to the handle. A sledge is used to drive the iron of the *tob-ók* into the plate that has to be perforated.

toktók: A kind of iron hook, used for roughening whetstones. The *toktók* consists of a crooked bar of metal, about one inch thick, and pointed at the top. Repeated taps with this instrument all over the surface of the whetstone cover the latter with small indentations, which render it rough to the touch. *Toktók* also means "pecking (of birds)."

tombók: A kind of iron pestle used for shaping ear pendants, and the like, in a mold. The object in question is pounded in the (*pag*)-*sokogán* or mold by means of the *tombók*, until it gets the desired shape.

toól(an): Helve (of an ax).

tópia: The moplike part, covered with feathers, of either of the two wooden pestles of the Iloko bellows. The upper parts or handles, devoid of feathers, are called *alili*. (Plate 2, fig. 11, *d*.) *Cf. yubuyúban*. *Topián* means "to fill up, to complete (a piece of cloth, a plot of ground, etc.)." To add (Plate 2, fig. 13, *a*) to the rest is called *topián*.

túdok: Spit. A slender pointed rod of iron for holding meat, fish, eggplants, and the like, while the latter are being roasted over the fire. *Túdok* also means "piercing."

tulbék: Key.

(pag)tuprá(an): Spittoon, cuspidor. *Tuprá* means "spittle;" the combination *pag . . . an* is a locative.

úging: Charcoal, soot.

(pag)úgis: Marker. Any kind of instrument used in drawing lines, for instance a pencil, a chisel, or a diamond point. *Ugis* means "drawing lines;" the prefix is an instrumental.

upig(án): Cf. *tampipi*.

upit: A kind of basket with a flat rectangular bottom, usually slung from the shoulder, and used for storing provisions for the journey, tools, and the like. The *upit* consists of two parts unequal in size, the smaller one fitting exactly in the larger one, which serves the former as a cover. It is as long at the base as it is at the ridgelike top, but the larger sides, which connect the top with the base, gradually bulge out from above downwards until they reach the base, while the smaller sides are triangular (with apex at the top of the basket) and generally flat. (Plate 2, fig. 12.)

walíwal: A kind of dibble used to make holes in the ground, especially for making fences. It consists of a comparatively heavy pointed pole, which is operated with both hands, and repeatedly driven into the ground and moved to and fro with a more or less circular motion until the hole is large enough for its intended purpose.

wásay: Ax.

wayway: A large thick supplementary rope, attached to the ordinary rope of an animal, in order to allow the latter more space for grazing.

weswés: A kind of iron broach used to pierce a hole in wooden handles, helves or shafts, in order to hold the tang of a knife, a spear, etc. The *weswés* has to be rendered red-hot before it can be used. The same name is applied to a child's toy, a kind of whirligig, consisting of a piece of a coconut shell or something similar, provided with two holes at its center and strung on a double rope which is held in both hands, one end of the rope in each hand. Both hands are moved successively toward the piece of shell and away from it, in order to make it whirl around with a rapid movement and produce a whizzing sound.

witiwit: Plowtail. The handle of a plow. (Plate 2, fig. 10, *f*.)

yakayák: Sieve. The *yakayák* is a kind of round basket, open-worked at the bottom, but with very small meshes. It is usually smaller than the *bigáo* or winnow.

yubuyúb(an): Bellows. The Iloko bellows consists of a hollow piece of earthenware (*ibeñg*), resting on the ground, provided at one of its sides with two small iron tubes (*añguyób*) through which the air is expelled into the fire, and surmounted by two large hollow wooden cylinders through which the air is drawn into the *ibeñg* by means of two pestles, whose lower ends (*tópia*) are covered with feathers, and which are moved up and down alternately, the operator taking hold of their handles (*alíli*), one in each hand. (Plate 2, fig. 11.) *Yubuyúb*(an) means: to blow (the fire), whether with an *añguyób* or blowpipe or with a *yubuyúban*.

ILLUSTRATIONS

Plate 1

Fig. 1. Pestle, *al-ó*.

2. Furnace; *anáwañg*. *a*, Ash pit or *pagkudkúdan*; *b*, *pagsuñgrúdan*; *c*, *pagsedáñgan*; *d*, chimney or *samborión*.

3. *Asad*, fork or dibble.

4. *Báñga*, jar or pot.

5. Sugar mill, *dadapilan*. *a*, *Kababái*; *b*, *kalaláki*; *c*, *tañgbáw*; *d*, *baláis*.

6. *Burnáy*, jar.

Plate 2

Figs. 7 and 8. *Paltik*.

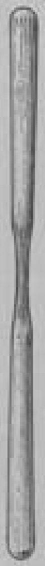
Fig. 9. *Kakém*.

10. Plow (moldboard and *saudán* not shown). *a*, Share or *sudsúd*; *b*, *tañgbáw*; *c*, *padila*; *d*, *pandáñg*; *e*, *patán*; *f*, plowtail, *witiwit*.

11. Bellows, *yubuyúban*. *a*, *Ibeñg*; *b*, *añgungób*; *c*, *alúi*; *d*, *tópio*.

12. *Upit*, basket.

13. *Topiáan*.



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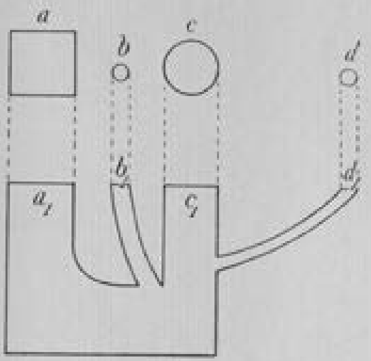

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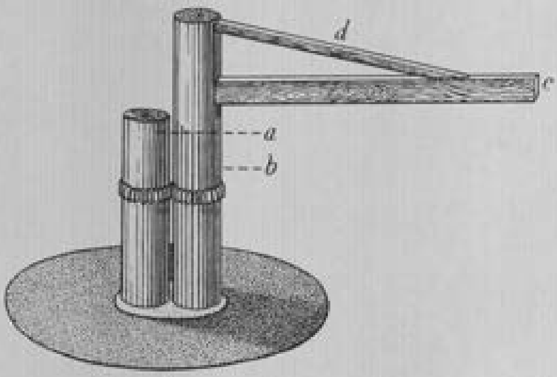

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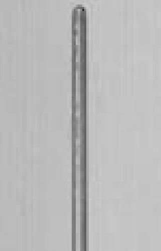

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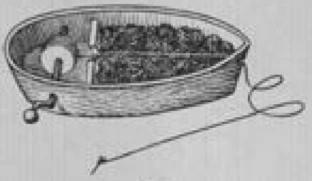
PLATE 1.



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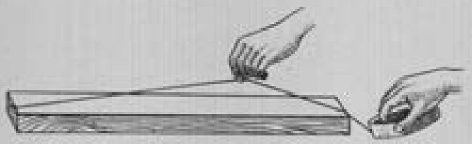

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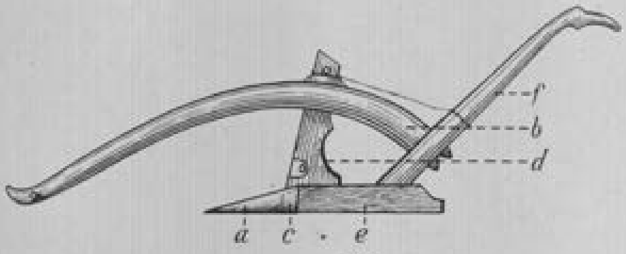

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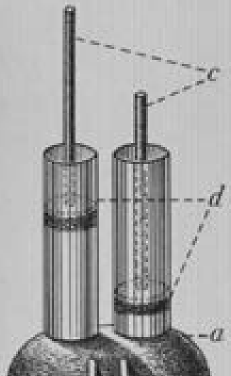

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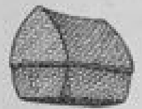

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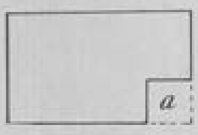

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PLATE 2.

THE GEOLOGY OF CALUBIAN AND VICINITY, LEYTE

By JUAN S. TEVES

Of the National Museum Division, Bureau of Science, Manila

ONE PLATE

LOCATION AND EXTENT

The region studied is the northernmost part of the northwestern peninsula of Leyte, and covers an area of over 200 square kilometers. It lies between 11° 18′ and 11° 34′ north latitude and 124° 17′ and 124° 29′ east longitude.

The region is reached from Manila by way of Cebu, whence small boats sail almost regularly to either San Isidro or Calubian, towns on the western and eastern coasts of the peninsula, respectively. It may also be reached by plane from Manila via Iloilo, where another plane may be chartered to Tacloban, and thence by any of the boats plying between that town and Cebu to Calubian.

The present paper is based largely on the study of the region made by the writer in the summer of 1936, but the works of previous geologists were also consulted.

The northwestern peninsula of Leyte has been visited by several geologists. Pratt(3) made an exhaustive study of this part of the island, which forms the basis of succeeding geological investigations. Adams(1) explored the island in 1909, and studied the rock formations near Eulalia, now known as Calubian, preparatory to the drilling of artesian wells. Faustino(2) located favorable structures in the areas leased in the Banisilan Oil Company in the municipalities of Leyte, Palompon, and Ormoc, and also in the areas covered by the leases of the Union Oil Company in the vicinity of Calubian.

Inspite of the considerable geologic work done, exploration by drilling was not started until all the leases expired. Very little is known of the northernmost portion of the peninsula as the results of its geological studies have never been published.

Recently, more visits were made for exploratory purposes, and the area covered by oil leases in the island is greater than ever before.

FIELD WORK

The field work covered in this report was done in the latter part of the summer of 1936, over a period of almost one month. The United States Coast and Geodetic Survey Map No. 14 of Leyte was used as the base map. Investigation was made mostly along the creeks and rivers, where excellent exposures were found. Study of the coast also yielded valuable data.

PHYSIOGRAPHY

Most of the area under consideration is marked by rolling topography. The hills responsible for this configuration provide a moderate relief, which averages about 100 meters.

A ridge parallel and close to the eastern coast has an elevation of 313 meters on the south end, and gradually lowers northward to 187 meters back of Villahermosa. On the west are high discontinuous elevations running parallel to the coast. On the north is a cluster known as Mount Bunacan, and on the south is Mount Igang.

On the northwestern end of the peninsula is a limestone plateau which is terraced near the coast. The plateau is about 76 meters above sea level, and the terrace 30 meters.

There is no extensive plain in this part of Leyte. The alluvial plain back of the town of San Isidro and that of Villalon are the only ones of importance. The latter is surrounded by a semicircular arrangement of hills suggesting a cirque.

Two large streams drain the region—the Calubian and the Mataguk. Their courses are largely influenced by geological structure.

A hydrogen sulphide spring was located at Moroboro, and another was reported at Tuburan. There is a carbonated spring at Villahermosa, where a public bathhouse has been constructed.

ROCK FORMATIONS

The predominant rock formations in this area are sedimentaries—the limestones, shales, and sandstones. There are also some igneous rocks, mostly andesites.

Limestones.—The limestones may be classified into two zones, the upper and the lower zones. The lower zone is massive, hard, and fairly resistant to weathering. It is fossiliferous, consisting mostly of fossil corals, bivalves and other mollusks. This zone, from all appearances, seems to be equivalent to the Malumbang formation which in Philippine stratigraphy is considered of Pliocene age. The Malumbang formation seems to overlie the shales and sandstones of the Vigo without unconformity.

The other zone, which occurs in the northwestern part of the peninsula, is made up mostly of coral reefs, which extend into the sea. This zone is evidently very young and probably is equivalent to the Pleistocene in Philippine stratigraphy.

Shales.—The shales are very fine-grained and compact, breaking into small pebblelike particles and, very rarely, into thin laminæ. Their color varies from light to dark, slightly bluish, gray. They contain minute shells. The shales and the overlying sandstones described below may be equivalent to the Vigo formations which are classified as Oligocene in Philippine stratigraphy.[1]

Sandstones.—The sandstones are of varying texture, from fine- to coarse-grained. Their color varies from light gray to light brown. Some beds are calcareous and fossiliferous, while others are tuffaceous. They belong to the same series as that of the shales described above.

Andesites.—Andesite boulders were found at the mouth of a creek near Uson Point (Matagnk) on the eastern coast. They are fine- to medium-grained, and gray. Some of the boulders are light-colored and contain plenty of hornblende. Pratt(3) believes these intrusives to be "evidently younger than the Malumbang series if they are responsible for the dispersion of the bituminous matter which is observed to impregnate part of the Malumbang series, south of Villaba."

Andesite agglomerates were found east of the town of Leyte. The included materials are of varying sizes of angular andesite pebbles. The matrix is also of andesite, although of much coarser grains. These agglomerates answer the description of Smith's(6) Zamboanga formation and may be identical to it.

Recent deposits.—The recent deposits of alluvial material are found along the creeks and rivers and also along the coasts.

GEOLOGIC STRUCTURE

The sedimentaries are slightly arched, forming an anticline near and parallel the eastern coast of the peninsula. This upbowing may possibly be the result of igneous activity, as evidenced by the presence of igneous boulders at the debouchure of a creek near Uson Point, as already noted above.

The dips are gentle, being in general from 8° to 10°, although locally there are a few high-angled ones. The general trend of the strikes is northwest, and the axis of the anticline plunges also in that direction. The direction of the dips and strikes can be seen in the accompanying aërial geologic map. The thickness of the sedimentary formations is estimated to be no less than 1,000 meters.

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[1] These were regarded as Miocene until subsequent study led authorities in Philippine geology to assign them to the Oligocene.

Mount Igang, midway between Tagharigui and Tuktuk, on the southern part of the area, seems to be another intrusion, judging by the attitude of the badly broken sedimentary formations on its slopes.

A limestone plateau lies on the northwestern part of the area. It is terraced near the coast, the elevation being 30 meters. The plateau proper is about 80 meters. The plateau and terrace seem to indicate two periods of uplift.

A fault, trending about 30° northwest, occurs along the western limb of the anticline. Another smaller one joins this at about the southern end of the anticline. These faults are indicated by bold limestone cliffs, which are in perfect alignment with the fault lines and also by the presence of slickensides at Moroboro.

The sedimentary formations along the coast, from Calubian southward, and on the west bank of the Consuegra River, from Gotosan to Butason, dip northeast. The agglomerates at the back of the town of Leyte appear to be a flow over the sedimentaries.

ECONOMIC GEOLOGY

While no minerals of economic importance have been found and developed in this region up to the present, it has been known since the nineties to contain oil. Almost the whole area is covered by geological leases, and prospecting for this valuable commodity in commercial quantities is very active.

ACKNOWLEDGMENT

The writer wishes to acknowledge his obligation to Mr. Quirico A. Abadilla, director of the Bureau of Mines, for suggestions and corrections in the presentation of this paper.

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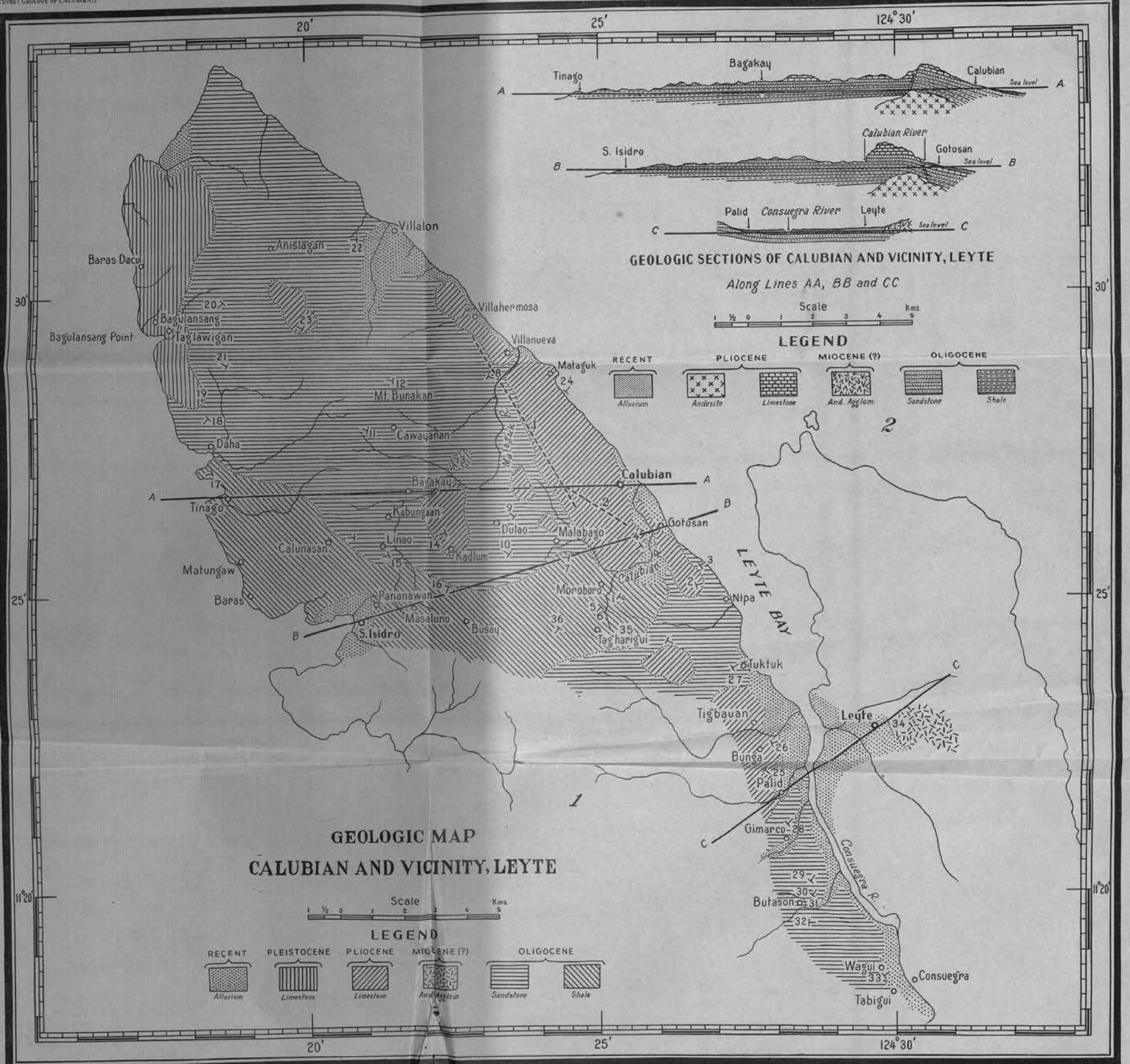
ILLUSTRATION

PLATE 1

FIG. 1. Aërial geologic map of Calubian and vicinity, Leyte.
2. Geologic cross sections through lines *A-A*, *B-B*, and *C-C*.



Based on U.S.C.G.S. map No 14

Traced by F.G. Evaristo 9/36

PLATE 1.

SUBAËRIAL DIATOMS FROM SHANGHAI

By B. W. Skvortzow
Of Harbin, Manchoukuo

TWO PLATES

Several years ago I received from my friend and enthusiastic collector Mr. J. Kovalchuk-Koval a sample of mosses collected by him on the bark of a tree in Shanghai May 19, 1933. As during recent years a good deal of attention has been paid to the activities of diatoms of a subaërial nature, living in the soil, in mosses, on rocks, and on the bark of trees, I undertook the examination of this collection.

Subaërial diatoms belong to the aërophilous algæ, which are adapted to obtaining their water by absorption of atmospheric moisture and which survive the usually frequent dry periods, on which they are dependent because of their mode of living, without undergoing any particular resting stages. In the Shanghai sample I was able to distinguish 30 different diatoms, three of which are new to science. Compared on the basis of the present material, the flora of subaërial diatoms from Shanghai has a comparatively large number of species in common with that of Europe; namely, *Melosira Roeseana* var. *epidendron*, *Synedra ulna*, *Cocconeis placentula*, *Frustulia rhomboides* var. *saxonica*, *Navicula ignota*, *Navicula contenta* fo. *biceps*, *Amphora Normanii*, *Gomphonema gracile*, *Rhopalodia gibba*, *Epithemia zebra*, *Epithemia sorex*, *Hantzchia amphioxys* with varieties, *Nitzschia frustulum* var. *perminuta*, and *Nitzschia Clausii*. In the main features, the growth forms are identical in type, but the floristic composition is different. Predominant are *Navicula Lagerheimii* Cleve and its three varieties. This diatom is known from moist rocks in Ecuador, South America, from tropical Africa, from mountain bogs of Java, and was recently reported from barks of trees in Calcutta, India. Common in Shanghai are *Hantszchia amphioxys*, *Melosira Roesana* var. *epidendron*, *Cymbella turgidula*, and *Rhopalodia gibba*. It was unusual to find *Rhopalodia Novae-Zealandiae* reported only from New Zealand. Two specimens were seen of this rare species. The following is the description of all diatoms recorded from this small collection. The diagrams of the author are made by Apochromat 2 and Compens Ocular 4 of E. Leitz, Weitzlar.

MELOSIRA ROESEANA Rabh. var. **EPIDENDRON** Grunow. Plate 1, figs. 14 to 16.

Melosira Roeseana Rabh. var. *epidendron* Grunow, VAN HEURCK, Synopsis (1880–1881) pl. 89, figs. 17, 18; FR. HUSTEDT, Kieselalgen (1927) 263, figs. 112*c*, *d*.

Valve cylindrical, with distinct pseudosulkus. Discus rim denticulate. Sulkus and neck broad. Cell wall with fine puncta in longitudinal rows. Valve covered with radiating rows of beads, central area with three large granules. Valve breadth, 0.0085 to 0.0136 mm; height, 0.01 to 0.014. Striæ 16 to 18 in 0.01 mm. Common. Reported from mosses and rocks in mountainous districts.

MERIDION CIRCULARE Agardh var. **CONSTRICTA** (Ralfs) Van Heurck. Plate 1, fig. 21.

Meridion circulare Agardh var. *constricta* (Ralfs) Van Heurck, FR. HUSTEDT, Bacillar. (1930) 131, fig. 119.

Valve clavate, with subcapitate apex and attenuate ends. Length, 0.037 mm; breadth, 0.006. Costæ 3, striæ 20 in 0.01 mm. Infrequent. Common in running water.

SYNEDRA ULNA (Nitzsch) Ehr. Plate 2, fig. 5.

Synedra ulna (Nitzsch) Ehr., FR. HUSTEDT, Bacillar. (1930) 151, 152, figs. 158, 159.

Valve linear-lanceolate, with attenuate, subacute ends. Length, 0.102 mm; breadth, 0.0042. Striæ transverse, 10 in 0.01 mm. Infrequent. Common in fresh water.

SYNEDRA RUMPENS Kütz. var. **MENEGHINIANA** Grunow. Plate 2, fig. 4.

Synedra rumpens Kütz. var. *Meneghiniana* Grunow, FR. HUSTEDT, Bacillar. (1930) 156, fig. 178.

Valve linear-lanceolate, gradually tapering from the middle to subacute ends. Length, 0.0816 mm; breadth, 0.0025. Striæ robust, distinct, 12 in 0.01 mm. Infrequent.

COCCONEIS PLACENTULA (Ehr.). Plate 2, fig. 10.

Cocconeis placentula (Ehr.), FR. HUSTEDT, Bacillar. (1930) 189, fig. 260.

Valve elliptic, with broad-rounded ends. Length, 0.017 mm; breadth, 0.012. The upper valve with narrow axial area. Striæ radiate, punctate, in longitudinal lines, 12 in 0.01 mm. Infrequent.

FRUSTULIA RHOMBOIDES (Ehr.) de Toni var. **SAXONICA** (Rabh.) de Toni. Plate 1, fig. 13.

Frustulia rhomboides (Ehr.) de Toni var. *saxonica* (Rabh.) de Toni, FR. HUSTEDT, Bacillar. (1930) 221, fig. 325.

Valve elliptic-lanceolate, tapering from the middle to subacute ends. Length, 0.061 mm; breadth, 0.012. Not common.

Genus NAVICULA Bory

NAVICULÆ LINEOLATÆ CLEVE

NAVICULA IGNOTA Krasske. Plate 1, fig. 11.

Navicula ignota KRASSKE, Beiträge zur Kenntnis der Diatomeenflora der Alphen. Hedwigia 72 (1932) 116, pl. fig. 19.
Navicula Licenti SKVORTZOW in Diatoms recoltees par le Pere E. Licent au cours de ses voyages dans le Nord de la Chine (1935) 40, pl. 9, figs. 11, 29.

Valve linear-lanceolate, triundulate, with rostrate, obtuse, ends. Length, 0.0357 mm, breadth, 0.005. Striæ slightly radiate, 15 in 0.01 mm. Not common. Larger than the type. Reported from mosses, Europe.

NAVICULA CINCTA (Ehr.) Kütz. var. **MINUTA** var. nov. Plate 1, fig. 17.

Valvis minoribus quam species, lineari-lanceolatis, cum polis rotundatis. Valvis longis, 0.0136 mm; latis 0.0034. Striis 12 in 0.01 mm, radiantes. Habit. in truncus arboris muscosis, Shanghai, Legit I. Kovalchuk-Koval.

Valve linear-lanceolate, with attenuate, rounded, ends. Axial area narrow, central broader. Striæ radiate. Length, 0.0136 mm; breadth, 0.0034. Striæ radiate, 12 in 0.01 mm. Differs from the type in its smaller size. The type is reported from fresh and brackish water.

NAVICULÆ ENTOLEIÆ CLEVE

NAVICULA CONTENTA Grun. fo. **BICEPS** Arnott. Plate 1, figs. 1 and 2.

Navicula contenta Grun., FR. HUSTEDT, Bacillar. (1930) 277, fig. 458c.

Valve linear, constricted in the middle part. Ends broad, subcapitate. Length, 0.0059 to 0.0085 mm; breadth, 0.0025. Striæ indistinct. Abundant. Reported from mosses.

NAVICULÆ MESOLEIÆ CLEVE

NAVICULA LAGERHEIMII Cleve. Plate 1, figs. 8 and 9.

Navicula Lagerheimii CLEVE, Synopsis of the Naviculoid Diatoms (1894) 1, 131; FR. HUSTEDT, Bacillariales aus Zellpflanzen Ostafrikas, gesammelt auf der akademischen Studienfahrt 1910. Hedwigia 62 (1921) 153, pl. 1, figs. 13, 15; A. SCHMIDT, Atlas Diatom. (1930) pl. 370, figs. 19–21.

Valve rhomboid-lanceolate, dilated in the middle, slightly triundulate with truncate ends. Length, 0.017 to 0.02 mm; breadth, 0.0068. Median line straight with central pores and terminal fissures curved in the same directions. Axial area very narrow; central area a broad, transverse rectangular fascia, reaching nearly to the margin, with an isolated punctum. Striæ 18 to 20 in 0.01 mm, radiate at the ends, coarsely punctate; puncta very fine. Not common. Reported on moist rocks from Ecuador, Pichincha, South America, from a mountain swamp in Java, and from tropical Africa.

NAVICULA LAGERHEIMII var. INTERMEDIA Hustedt. Plate 1, figs. 3, 4, and 32.

Navicula Lagerheimii Cleve var. *intermedia* Hustedt, A. SCHMIDT, Atlas Diatom. (1930) pl. 370, fig. 22.

Navicula pseudoseminulum Skvortzow and var. *curta* SKVORTZOW, Diatoms from Calcutta, India (1935) 183, pl. 1, figs. 18, 19.

Navicula pseudoseminulum SKVORTZOW, Diatoms recoltees par le Pere E. Licent dans le Nord de la Chine (1935) 40, pl. 9, fig. 27.

Differs from the type in its elliptic, not triundulate valves, with broad, obtuse ends. Length, 0.015 to 0.0204 mm; breadth, 0.0053 to 0.0068. Striæ radiate, 18 to 20 in 0.01 mm, with a distinct isolated punctum on one side of the valve. This variety is reported from mountain bogs in Java, from bark of trees in Calcutta, India, and from barks of trees in northern Manchuria.

NAVICULA LAGERHEIMII Cleve var. CAPITATA var. nov. Plate 1, fig. 7.

Differt a typo polis capitatis, Poro solitario distinctis. Valvis longis 0.015 mm; latis 0.0068. Striis 18 in 0.01 mm. Habit. in truncus arborum muscosis, Shanghai. Legit I. Kovalchuk-Koval.

Valve elliptic-ovate, with capitate ends. Isolated puncta distinct. Length, 0.016 mm; breadth, 0.0068. Striæ 18 in 0.01 mm. Differs from the type in its capitate ends. Infrequent.

NAVICULA LAGERHEIMII Cleve var. OVATA var. nov. Plate 1, figs. 5, 6, and 34.

Differt a var. intermedia valvis abbreviatis, ovatis, cum polis rotundatis. Valvis longis 0.0085 ad 0.01 mm; latis 0.005 ad 0.0068. Striis 18 ad 20 in 0.01. Habit. in truncus arborum muscosis, Shanghai. Legit I. Kovalchuk-Koval.

Valve ovate, slightly attenuate and rounded at the ends. Length, 0.0085 to 0.01 mm; breadth, 0.005 to 0.0068. Striæ 18 to 20 in 0.01 mm. Differs from var. *intermedia* in its shorter and more rounded ends. Not common.

PINNULARIA GIBBA Ehr. Plate 1, fig. 26.

Pinnularia gibba Ehr., FR. HUSTEDT, Bacillar. (1930) 327, fig. 600.

Valve linear, with almost parallel margins and subcapitate, slightly apiculate ends. Axial area narrow, central area a broad fascia. Length, 0.068 mm; breadth, 0.012. Striæ radiate, 9 in 0.01 mm. Rare.

AMPHORA NORMANII Rabh.? Plate 1, fig. 13.

Amphora Normanii Rabh., VAN HEURCK, Synopsis (1880–1881) pl. 1, fig. 12; FR. HUSTEDT, Bacillar. (1930) 343–344, fig. 630.

Valve semielliptic, arcuate on dorsal and almost straight on ventral margins. Length, 0.012 mm; breadth, 0.0025. Striæ indistinct. Smaller than the type. An alpine species, common in mosses.

CYMBELLA PERPUSILLA A. Cleve. Plate 1, fig. 10.

Cymbella perpusilla A. CLEVE, On recent fresh-water diatoms from Lule Lappmark in Sweden (1895) 19, pl. 1, fig. 13.

Valve asymmetrical, lanceolate, with moderately arcuate dorsal, and almost straight ventral margins. Ends obtuse. Length, 0.0153 mm; breadth, 0.0042. Striæ slightly radiate, ventral and dorsal 18 to 20 in 0.01 mm. No isolated punctum. Infrequent. A mountain and northern species, reported from Europe.

CYMBELLA CISTULA (Hemp.) Grun. Plate 2, fig. 11.

Cymbella cistula (Hemp.) Grun., FR. HUSTEDT, Bacillar. (1930) 363, fig. 676*a*.

Valve asymmetrical, boat-shaped, with arcuate dorsal and centrally gibbous ventral margins. Ends attenuate, obtuse. Length, 0.061 to 0.01 mm; breadth, 0.017 to 20. Striæ robust, punctate, ventral 9, dorsal 6 in 0.01 mm. Infrequent.

CYMBELLA TURGIDULA Grun. Plate 1, figs. 27 and 31.

Cymbella turgidula Grun., FR. HUSTEDT, Bacillar. (1930) 362, fig. 670; A. SCHMIDT, Atlas Diatom. (1931) pl. 376, figs. 8 to 13.

Valve asymmetrical, elliptic-lanceolate with arcuate dorsal margin and centrally gibbous ventral margin. Ends subrostrate and obtuse. Length, 0.0403 mm; breadth, 0.011 to 0.0136. Striæ robust, punctate, radiate, ventral 8 to 9, dorsal 7 to 8 in 0.01 mm, with one or two distinct isolated puncta near the central nodule. Infrequent. Common in tropical regions.

GOMPHONEMA CONSTRICTUM Ehr. Plate 1, fig. 3.

Gomphonema constrictum Ehr., FR. HUSTEDT, Bacillar. (1930) 377, fig. 714; A. SCHMIDT, Atlas Diatom. (1904) pl. 247, figs. 3-11.

Valve clavate, with broad-capitate apex and narrow basis. Length, 0.037 mm; breadth, 0.01. Striæ 12 in 0.01 mm. Rare.

GOMPHONEMA GRACILE Ehr. Plate 1, fig. 20.

Gomphonema gracile Ehr., FR. HUSTEDT, Bacillar. (1930) 376, fig. 702.

Valve lanceolate-naviculiform, slightly clavate. One end broader than the other. Length, 0.0408 mm; breadth, 0.0085. Isolated punctum distinct. Infrequent.

RHOPALODIA GIBBA (Ehr.) O. Müll. Plate 1, fig. 30; Plate 2, figs. 1, 7, and 12.

Rhopalodia gibba (Ehr.) O. Müll., A. SCHMIDT, Atlas Diatom. (1905) pl. 253, figs. 1–13.

Valve linear, arcuate in the middle part of the dorsal margin and slightly reflexed and attenuate at the ends. Length, 0.056 to 0.101 mm; breadth, 0.009 to 0.01. Costæ 7, striæ 14 to 18 in 0.01 mm. Common.

RHOPALODIA NOVAE ZEALANDIAE Hustedt. Plate 1, fig. 29.

Rhopalodia Novae Zealandiae Hustedt, A. SCHMIDT, Atlas Diatom. (1913) pl. 294, fig. 40.

Valve semilanceolate, gradually arcuate at the dorsal margin and interrupted in the middle part. Straight on ventral margin. Length, 0.095 mm; breadth, 0.01. Striæ 15 in 0.01 mm. No robust costæ. Rare. Reported from New Zealand.

EPITHEMIA ZEBRA (Ehr.) Kütz. Plate 2, fig. 5.

Epithemia zebra (Ehr.) Kütz., FR. HUSTEDT, Bacillar. (1930) 384, 385, fig. 729.

Valve semielliptic, arcuate at the dorsal margin and almost straight at the ventral. Length, 0.0374 mm; breadth, 0.01. Costæ 3, striæ 9 to 10 in 0.01 mm. Not common.

EPITHEMIA ZEBRA (Ehr.) Kütz. var. **PORCELLUS** (Kütz.) Grunow. Plate 3, fig. 4.

Epithemia zebra (Ehr.) Kütz. var. *porcellus* (Kütz.) Grunow, FR. HUSTEDT, Bacillar. (1930) 385, fig. 731.

Valve semielliptic, with capitate ends. Length, 0.0476 mm; breadth, 0.0085. Costæ 4, striæ 9 to 10 in 0.01 mm. Common.

EPITHEMIA SOREX Kütz. Plate 2, fig. 4.

Epithemia sorex Kütz., FR. HUSTEDT, Bacillar. (1930) 385, fig. 736. A. SCHMIDT, Atlas Diatom. (1904) pl. 252, figs. 22–28.

Valve lunate, with arcuate dorsal and convex ventral margins. Ends capitate. Length, 0.0374 mm; breadth, 0.01. Costæ 7 in 0.01 mm. Infrequent.

HANTZSCHIA AMPHIOXYS (Ehr.) Grunow. Plate 1, figs. 31, 32, and 26.

Hantzschia amphioxys (Ehr.) Grunow, A. SCHMIDT, Atlas Diatom. (1921) pl. 329, figs. 15–20.

Valve linear, asymmetrical with slightly arcuate dorsal and convex ventral margins. End subrostrate and obtuse. Length, 0.0289 to 0.034 mm; breadth, 0.0051 to 0.0058. Costæ 8 to 10, striæ 20 to 23 in 0.01 mm. Common. A diatom common in mosses and on moist rocks.

HANTZSCHIA AMPHIOXYS (Ehr.) Grun. var. **XEROPHILA** Grunow. Plate 1, fig. 13.

Hantzschia amphioxys (Ehr.) Grun. var. *xerophila* GRUNOW, A. Diatomeen von Franz Josefs Land (1884) 99.

Valve minute, linear, with subrostrate ends. Length, 0.022 mm; breadth, 0.0034. Costæ 8, striæ about 30 to 35 in 0.01 mm. Infrequent. Differs from the type in its coarser striæ.

HANTZSCHIA AMPHIOXYS (Ehr.) Grun. var. **RUPESTRIS** Grunow. Plate 2, fig. 7.

Hantzschia amphioxys (Ehr.) Grun. var. *rupestris* Grunow, A. SCHMIDT, Atlas Diatom. (1922) pl. 345, fig. 14.

Differs from the type in the more elongate ends. Length, 0.057 mm; breadth, 0.0068. Costæ 7, striæ 18 in 0.01 mm. Infrequent.

NITZSCHIA FRUSTULUM (Kütz.) Grun. var. **PERMINUTA** Grunow. Plate 1, fig. 15.

Nitzschia frustulum (Kütz.) Grun. var. *perminuta* Grunow, VAN HEURCK, Synopsis (1880–1881) pl. 99, fig. 7.

Valve lanceolate, with subacute ends. Length, 0.055 mm; breadth, 0.0022. Costæ 14 in 0.01 mm. Striæ very fine, indistinct. Reported from the bark of trees in Calcutta, India.

NITZSCHIA CLAUSII Hantzsch. Plate 1, fig. 22.

Nitzschia Clausii Hantzsch, A. SCHMIDT, Atlas Diatom. (1921) pl. 336, figs. 7–11.

Valve linear, with sigmoid, attenuate, acute, ends. Length, 0.0357 mm; breadth, 0.0025. Costæ 8 in 0.01 mm. Striæ indistinct. Infrequent. Reported from fresh and brackish water.

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ILLUSTRATIONS

Plate 1

FIGS. 1 and 2. *Navicula contenta* fo. *biceps* Arnott.
3 and 4. *Navicula Lagerheimii* Cleve var. *intermedia* Hust.
5 and 6. *Navicula Lagerheimii* Cleve var. *ovata* var. nov.
FIG. 7. *Navicula Lagerheimii* Cleve var. *capitata* var. nov.
FIGS. 8 and 9. *Navicula Lagerheimii* Cleve.
FIG. 10. *Cymbella perpusilla* A. Cleve.
FIGS. 11 and 12. *Hantzschia amphioxys* (Ehr.) Grun.
FIG. 13. *Hantzschia amphioxys* (Ehr.) Grun. var. *xerophila* Grun.
FIGS. 14 to 16. *Melosira Roeseana* Rabh. var. *epidendron* Grun.
FIG. 17. *Navicula cincta* (Ehr.) Kütz. var. *minuta* var. nov.
18. *Amphora Normanii* Rabh.?
19. *Frustulia rhomboides* (Ehr.) de Toni var. *saxonica* (Rabh.) de Toni.
20. *Gomphonema gracile* Ehr.
21. *Meridion circulare* Agardh var. *constricta* (Ralfs) Van Heurck.
22. *Nitzschia Clausii* Hantz.
23. *Nitzschia frustulum* (Kütz.) Grun. var. *perminuta* Grun.
24. *Navicula Lagerheimii* Cleve var. *ovata* var. nov.
25. *Navicula ignota* Krasske.
26. *Pinnularia gibba* Ehr.
27. *Cymbella turgidula* Grun.
28. *Hantzschia amphioxys* (Ehr.) Grun.
29. *Rhopalodia Novae Zealandiae* Hust.
30. *Rhopalodia gibba* (Ehr.) O. Müll.
31. *Cymbella turgidula* Grun.
32. *Navicula Lagerheimii* Cleve var. *intermedia* Hust.

Plate 2

FIGS. 1 and 2. *Rhopalodia gibba* (Ehr.) O. Müll.
FIG. 3. *Gomphonema constrictum* Ehr.
4. *Epithemia sorex* Kütz.
5. *Synedra ulna* (Nitzsch) Ehr.
6. *Synedra rumpens* Kütz. var. *Meneghiniana* Grun.
7. *Hantzschia amphioxys* (Ehr.) Grun. var. *rupestris* Grun.
8. *Epithemia zebra* (Ehr.) Kütz. var. *porcellus* (Kütz.) Grun.
9. *Epithemia zebra* (Ehr.) Kütz.
10. *Cocconeis placentula* (Ehr.)
11. *Cymbella cistula* (Hemp.) Grun.
12. *Rhopalodia gibba* (Ehr.) O. Müll.

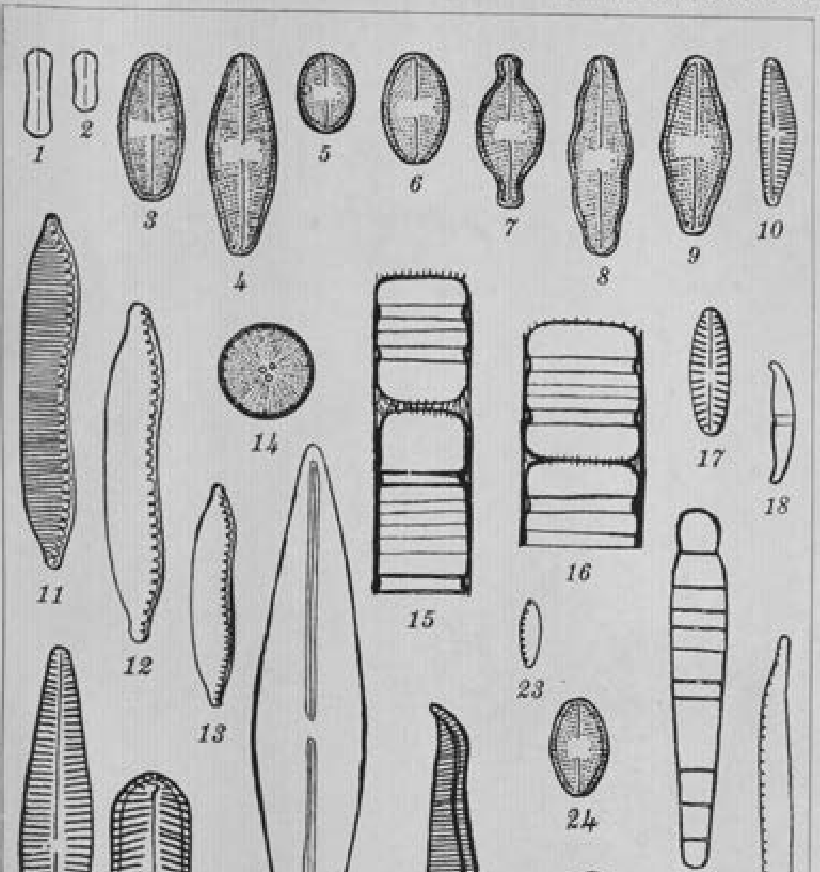

PLATE 1.

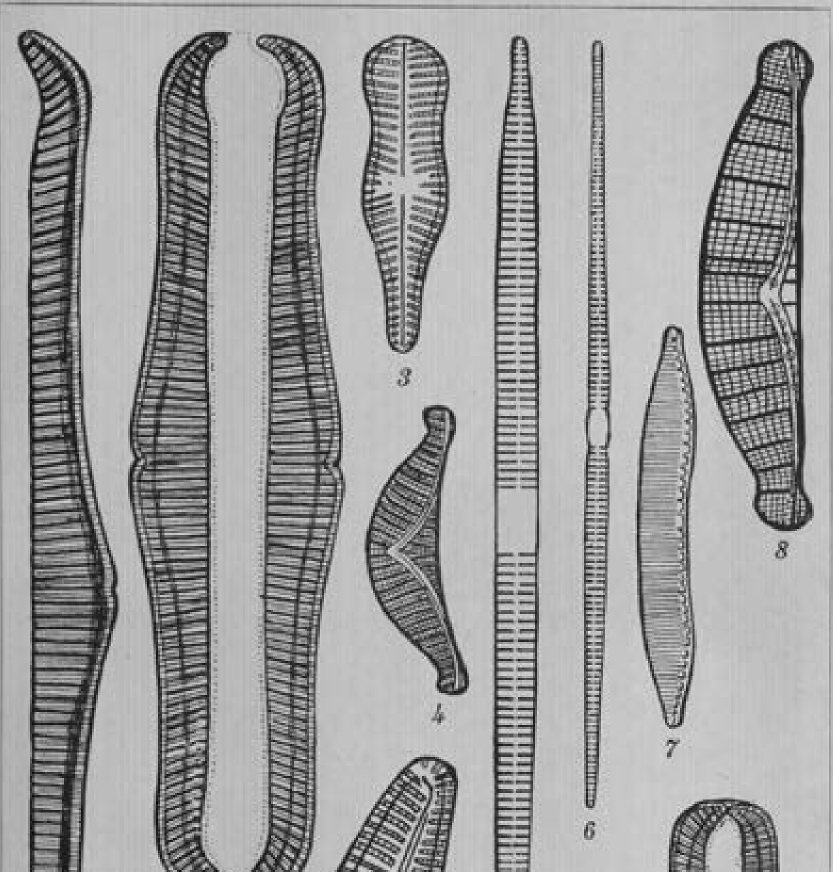

PLATE 2.

BOOKS

Acknowledgment of all books received by the Philippine Journal of Science will be made in this column, from which a selection will be made for review.

RECEIVED

Academy of natural science of Philadelphia. Discovery: science at work, by the Managing director. The Academy, 1936. 20 pp. Gratis.

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WOOD, R. C. A note-book of tropical agriculture. Trinidad, The Imperial college of tropical agriculture, 1937. 147 pp.

REVIEWS

Air Conditioning; Fundamental Principles, Practical Installations and Ozone Facts. By E. W. Kiesbeck. Chicago, Goodheart Willcox Company, Inc., 1934. 332 pp., illus., diagrams, charts. Price, $3.50.

This book is written in nontechnical language, so that anyone wishing to familiarize himself with air conditioning and related subjects, such as refrigeration, cold storage, plant operation, the use of ozone, and the sterilization of water, may gain a thorough understanding of these important subjects. The author has had many years of practical experience in heating, ventilating, air conditioning, and power-plant operation. The book is well illustrated with charts, diagrams, and photographic reproductions of air-conditioning apparatus and their auxiliaries.

This book does not only profit designers, manufacturers and owners of air-conditioning apparatus, but it is also important for students and the general public to gain further knowledge about the value and benefit of air conditioning.—B. R. D.

A Catalogue of the African Hesperiidæ; Indicating the Classification and Nomenclature Adopted in the British Museum. By Brigadier W. H. Evans. London, Printed by Order of the Trustees of the British Museum, 1937. 212 pp., 30 Plates. With a Preface by N. D. Riley, Keeper of Entomology, British Museum (Natural History). Price, £1.

This catalogue is a notable contribution to systematic entomology and should be of value especially to workers on skippers (Hesperiidæ). As Captain Riley states in the preface, the title of the volume and its size are but a very poor indication of the labor involved in the compilation of the book and the extent of the additions made by the author to the knowledge of the African skippers. Indeed, the book is not a mere catalogue, as the author has brought the classification of the members of the family up to date and has correlated certain Æthiopian and Oriental genera.

The author's classification of the members of the Hesperiidæ is the most advanced so far. He has divided the family into nine groups with seventy genera, four hundred twenty-two species, and two hundred sixty-six subspecies or forms, of which sixteen genera, sixty-seven species, and seventy-eight subspecies or forms are new.

Because of the purely nontechnical words employed in the various descriptions, the book is very useful to lay people who may wish to collect insects merely for their beauty and rarity, and as a reference book for beginning students in systematic entomology.—S. R. C.

Diseases of Vegetable Crops. By J. C. Walker. Ann Arbor, Michigan, Edwards Brothers, Inc., 1936. 65 pp. Price, $1.60.

This book gives in outline the important facts concerning the major diseases of vegetable crops. Brief notes are given on the culture and marketing of each crop plant, and the diseases are taken up according to host groups. The major diseases are treated under the following heads: Hosts, history, occurrence, economic importance, symptoms, causal organism, life history of causal organism, pathological histology, environmental relations, varietal resistance, and control. Many minor diseases are also listed. To each disease are appended a number of key references. The book has an index of diseases arranged alphabetically under hosts.

This book is a handy reference for vegetable gardeners and for students of plant pathology. The text is a photo-lithoprint reproduction of the author's manuscript and, being reproduced on one side of the page only, leaves a useful blank side for notes and other remarks on local conditions.—J. M. M.

Electrolytic Oxidation and Reduction: Inorganic and Organic. By S. Glasstone and A. Hickling. New York, D. Van Nostrand Company, Inc., 1936. 420 pp. Price, $9.

This book gives a good survey of the field indicated by its title. It deals with reactions involving inorganic as well as organic compounds, giving brief but comprehensive and clear discussions of the oxidation and reduction processes carried out by electrolytic methods, as well as of the underlying principles of the reactions described. Frequent reference is made to the recent as well as to the older investigations on the subject.

At the end of each of the eleven chapters is a good bibliography of the subject treated. Such lists of references are not easily available elsewhere, and should make the volume helpful to lecturers and researchers in the field of electrolytic oxidation and reduction.—F. L. R.

Ford V8 Cars and Trucks; Construction—Operation—Repair; a Most Complete and Practical Manual Explaining the Construction of all Parts of Late Model Ford Automobiles with Instructions for Driving, Servicing and Repairing; Written in Simple Language; a Universal Book of Reference. By Victor W. Page. New York, Norman W. Henley Publishing Co., 1937. 360 pp., charts, diagrams, photo. Price, $2.50.

This volume is a complete treatise on all Ford V8 cars from the earliest 1932 models to the latest 1937 cars. The author, who has been writing the Ford Manual as a yearly feature since 1912, is an expert on Ford cars, who owned and operated numerous models, starting from Model T. The book is thoroughly illustrated by many specially made diagrams and distinctive original photographs of actual parts furnished by the factory service department.

As stated by the author, there is no royal road to knowledge. Experience, supplemented by the study of the instructions contained in this treatise, is the best teacher. The book is divided into twenty-one chapters of authoritative and comprehensive data about performance, operation, upkeep, and practical application.

This book is a valuable reference for owners, operators, service men, dealers, and mechanics of the Ford V8, for it meets every question with regard to Ford cars.—B. R. D.

A Handbook of Tropical Therapeutics. By R. N. Chopra. Calcutta, Art Press, 1936. 1748 pp. Price, R27.50.

This encyclopædic work on tropical diseases is written by a man who is highly qualified to write a book on such a subject. For fifteen years he has been closely associated with postgraduate students at the Calcutta School of Tropical Medicine of which he is the Director. As superintendent of the Carmichael Hospital for Tropical Diseases he has also conducted pharmacological investigations in his laboratories in the hospital. In this book the author attempts "to review the whole subject of therapeutics with due regard to the climatic conditions met with in the tropics generally and in India particularly."

The book is divided into six parts. Part I deals with general considerations of therapeutics, and includes such intricate subjects as the action of drugs, conditions modifying drug action, modes of administration and details of technique, chemotherapy, physiotherapy, diet and dietetics in the Tropics, the treatment of pain and insomnia, and the use of tonics. Part II is a complete exposition of remedies used against helminthic diseases, those acting on cestodes and nematodes, as well as miscellaneous anthelmintics and their action on somatic parasites. Part III deals with remedies used against protozoan diseases, amœbiasis, leishmaniasis, trypanosomiasis, malaria, and spirochætosis. Part IV discusses the treatment of bacterial and virus diseases, which are of special interest in tropical climates. A large amount of space has been allotted to the general discussion of vaccines, sera, and bacteriophages in therapeutics. Part V deals with the treatment of miscellaneous diseases met with in the Tropics. The nutritional disorders, such as beriberi, epidemic dropsy, and pellagra, and metabolic disorders, including diabetes mellitus and obesity, are dealt with. Part VI deals with the treatment of skin diseases, and is followed by a dictionary of diagnosis and treatment of the conditions met with in the Tropics, which cannot be strictly grouped under the heading of tropical diseases. The appendices contain abstracts from journals, bringing certain sections up to date (end of 1935); there are also posological tables of drugs and preparations, notes regarding important nonofficial remedies, physiological constants, tables of bacteria, metazoa and protozoa, and a large amount of other information required almost every day by the medical practitioner.

This book is a very valuable addition to the few available works on tropical medicine. There are 1,748 pages packed with useful information especially valuable to medical practitioners in the Philippines. The book is highly recommended as a useful reference book for physicians.—M. B.

Heart Disease and Tuberculosis; Efforts Including Methods of Diaphragmatic and Costal Respiration to Lessen their Prevalence. By S. Adolphus Knopf. New York, Livingston Press, 1936. 108 pp., illus. Price, $1.25.

The bold introductory remark that "heart disease is now king of Death," sounds interesting and invites the reader to go on further in the vast field of cardiac incidence and mortality in the United States, where the author has distinguished himself as an eminent phthisiologist. His assertion is ably supported by statistics and figures from insurance companies. On this account he pleads for a more extensive program of treatment and prevention for heart disease similar to what is being done for tuberculosis. After giving short remarks on the etiology, modern therapy, and occupational incidence of heart diseases, particularly those of hypertensive and arteriosclerotic types, he dwels more comprehensively on diaphragmatic respiration and its benefit to circulatory diseases. The value of this new therapeutic adjunct, which no ordinary practitioner may ably estimate, is shown by the many favorable remarks of prominent cardiologists.

Of all the interesting and instructive information given on tuberculosis, the use of the recently developed Power's X-ray camera, and ingenious instrument for taking rapid and economical X-ray pictures, is most striking from the point of view of public health. This apparatus would give invaluable service in the mass examination of school children and employees.

This little book is full of information, ably illustrated and indexed, and backed up by a wealth of experience in the field of cardiology and tuberculosis.—I. F.

House Wiring; a Treatise describing and illustrating up-to-date methods of installing electric light wiring, bell and telephone wiring, and burglar alarm wiring. By Thomas W. Poppe and Harold P. Strand. 8th ed. revised and enlarged. New York, Norman W. Henley Publishing Co., 1937. 256 pp., illus., diagrams. Price, $1.

This book is familiar to engineers and master electricians. The present edition is more fully illustrated and has been brought up to date by changes to conform with the latest rulings of the United States National Board of Fire Underwriters and the newest trade practices.

The book is written in simple language and so well illustrated that it is understandable even to those who are not technically trained. It is therefore a great help to apprentices, helpers, and electricians for the many labor- and time-saving operations and diagrams described and illustrated. The book consists of sixteen chapters full of useful and practical information on all problems of wiring.—F. D. M.

Malaria in Europe; an Ecological Study. By L. W. Hackett. London, Oxford University Press, 1937. 336 pp., illus., diagrams. Price, 10s 6d.

This admirable brief narration of malarious conditions in Europe contains abridged and correlated discussions on the malaria situation in different countries, such as Italy, Spain, Holland, the Balkans, and others. In the course of these discussions the malaria situation in countries outside of Europe, such as Panama, the United States, the Philippines, the Netherlands Indies, Malaya, India, and others, have also been touched upon. In a way, it is an exposition of newer findings, of theories and counter theories, of hypotheses and counterhypotheses, on malaria in Europe and abroad. For ten years, the author has done extensive work in the investigation and control of malaria in Europe under the Rockefeller Foundation.

The malaria situation of Europe became a puzzle when it was noted that there were places where the supposed anopheles vector of the diseases (*Anopheles maculipennis*) was abundant, and yet there was no malaria, and vice versa. The distribution of malaria in Europe thus revealed interesting fundamental facts.

The immunity or resistance of the human body against the malaria parasites is very well discussed. There are also chapters on the theory and practice in the treatment of malaria and the conditions of the temperate-climate malaria. Two chapters of particular interest to malariologists are those on the strategy of malaria control and on the various fundamental lines of attack upon the disease.

Fundamental measures in the control of malaria have been discussed under the following headings: (*a*) Suppression of gametocytes in human carriers; (*b*) protection of human beings from mosquitoes; (*c*) destruction of larvæ in the water; (*c*) permanent elimination of breeding places; (*d*) natural methods of control.—A. E.

Petroleum Development and Technology, 1937. Transactions of the American Institute of Mining and Metallurgical Engineers, Vol. 123, Petroleum Division. New York, The Institute, 1937. 689 pp. Price, $5.

This book is made up of a collection of selected papers delivered at the meetings of the Petroleum Division. The papers are grouped under seven chapter headings as follows: Production Engineering, Production Engineering Research, Stabilization, Petroleum Economics, Production, Petroleum Engineering Education, and Refining.

The Committee has included many papers on the engineering phases of petroleum technology. These papers deal with the latest development in production engineering, research, and refining. Considerable data is given concerning individual fields, producing horizons, well depths, output, and the like. Two chapters deal with the increasingly interesting and significant subjects of politics and business in their relations to the petroleum industry. The improvement of the training of future petroleum engineers is also discussed with emphasis on combined class and field work.

This book is composed of highly involved and technical papers that are related only in a general way. Although it gives a good idea of the recent developments in petroleum technology, it has small value for anyone wanting a general picture of that subject. However, the student or engineer desiring recent information on a given phase of petroleum technology should find this a useful and interesting text.—W. B. M.

A Treatise on Materia Medica and Therapeutics, including Pharmacy, Dispensing, Pharmacology and Administration of Drugs. By the Late Rakhaldas Ghosh. 14th ed. by Birendra Nath Ghosh. Calcutta, Hilton & Co., 1936. xvi + 724 pp. Price, ₱6.50.

This enlarged and revised volume contains additions made by the author of the present edition to take care of the recent changes in the British Pharmaceutical Codex. It is now largely, a volume on pharmacology as applied to therapeutics. An extensive revision of some drugs was made, especially iron, general anæsthetics, opium, barbiturates, digitalis, anterior pituitary, ergot, quinine, and the vitamins. A discussion on the following drugs is included in the volume for the first time: thalium, myocrisin, eukodal, dilaudide, dicodide, evipan, sodium evipan, soneryl sodium, bulbocapnine, harmine, percaine, gavano, coramine, carditone, manganese butyrate, synthalin, neptal, carbasone, vioform, antivenom serum, and pertussis vaccine.

Those who are not acquainted with the work will find it a very useful source of information on the pharmacology and therapeutics of drugs and preparations, particularly those in the official British Pharmacopœia.

Part VI, which deals with Indian indigenous drugs, is of interest to workers on tropical medicinal plants, because it contains important data on a number of such drugs. Some of the drugs discussed in this part of the work, which are similar to those obtained from medicinal plants growing in the Philippines are: Bael fruit, dita bark, volatile oil from betel leaves, and dried bark of the stem of *Melia azadirachta*.—P. V.

Vitamins and Other Dietary Essentials. By W. R. Aykroyd. 2d ed. London, William Heinemann (Medical Books) Ltd., 1936. 226 pp. Price, 7s 6d.

This second edition of this most interesting book on the science of dietetics discusses remarkable and revolutionary changes in our fundamental ideas about medicine and public health. It is a valuable and instructive book, giving a comprehensive discussion of the historical development of the modern science of nutrition, deficiency diseases, vitamins, and other dietary essentials. The practical application of our present-day knowledge of the dietary properties of foodstuffs, especially on perfect diet and its close relation towards good physique and better health, is thoroughly covered.—A. J. H.

American Medicine; Expert Testimony Out of Court. The American Foundation, New York, c1937. 2 vols. 1435 pp. Price, $3.50 net.

The degree to which a government may serve its citizens, and, on the other hand, how citizens may best serve their government, is being studied by the American Foundation's Committee in Government, which is conducting research along these lines in ten fields.

American Medicine: Expert Testimony Out of Court contains the first fruits of this research. The present two volumes consist of excerpts from some 5,000 letters, written by 2,200 medical men, including deans of medical schools, professors of medicine, general practitioners, and specialists. The views of these men on medical care as a matter of human right, and on the question as to how the achievements of medical science can best be distributed, are analysed, classified, and correlated.

Among the outstanding ideas in the report are:

1. The solution of the problem of the indigent sick is the development of the highest type of doctor who is competent and willing to supply medical care on a broad social base.

2. Medical schools are performing a terrific task with increasing effectiveness, yet at present the quality of practice by the average physician is not good enough. Much still needs to be done to give better training to doctors. Once trained, moreover, they must keep in training.

3. Medical care is not a commodity. It is a changing fluid thing, not adaptable to the blue prints of social engineering.

4. Postgraduate training in medicine is necessary and should be subsidized by the State.

5. A license to practice medicine should not be good for life, unless the holder keeps abreast of the more important developments in medical science. The State should force upon even the reluctant or inert portions of the profession a reasonable degree of performance in the matter of intellectual activity and of keeping pace with times.

6. Free, flexible, and supported research is a primary practical factor in adequate medical care.

7. Even if adequate medical care were available now to all, a large part of the population would still choose quacks, cults, and patent medicines. In the United States there are each year some 40,000 cases of smallpox; one sees, too, and in spite of considerable popular education, a large dependence upon patent medicine, magic, and healers of various kinds; and it cannot be

said that all such dependence is based upon slender financial resources. Medical education and general education of a country must be integrated.

8. The enormous expense of modern diagnostic equipment should be borne by the state to improve medical care for patients in the lower income brackets.

The first division of the report contains a searching analysis of medicine itself, a discussion of possible improvements in medical practice, and a definition of objectives in medical education. The second division analyzes all the solutions of the problems that have been brought forward—health insurance in the various forms, state medicine, and others. Out of this presentation comes the clear indication that medical care of the sick in a government, as a living partnership, is possible only by giving medicine a new social purpose and direction through intelligent planning.

The report is a rich source of stimulating experience. It does not think for the reader, but it makes him think. No one who reads it can fail to learn a better medicine than the one he knew yesterday or before yesterday. The work has no index, but the contents are outlined in detail at the beginning of the book. The volumes are sold below cost so as to afford every medical man an opportunity to own a set.—D. d. l. P.

Appendicitis, When and How to Operate; a Guide for the General Practitioner. By W. J. Stewart McKay. Sydney, Australia, Angus & Robertson, Ltd., 1936. 260 pp., illus. Price, 6s.

This book is intended as a guide for the general practitioner in the country. In a very wordy style the author points out what a country practitioner should do before an operation, describing every step in a simple operation, and discussing the difficult cases that should not be operated. He believes that "cold is the chief exciting cause of appendicitis," and is most common among those suffering from enlarged tonsils and adenoids. Inspite of its wordiness, the book is valuable to general practitioners and surgeons of limited experience.—C. D. F.

Coffee; the Epic of a Commodity. By Heinrich Eduard Jacob. Translated by Eden and Cedar Paul. New York, Viking Press, 1935. 296 pp., illus. Price, $3.50.

Here is a book that is as stimulating as a drink of good coffee on a dull afternoon. It contains a fast-moving story, depicted against a rich romantic setting, of coffee and its addicts and more and more numerous converts. Coffee is portrayed as a hero whose struggles for supremacy over such formidable rivals as wine, beer, and other liquor during the last three centuries has influenced the trend of human culture and human thought,—of civilization itself. Like that of any other conqueror, the popularity of coffee has resulted in unprecedented heights of overproduction that has threatened its economic stability. But man's genius has time and again saved the commodity from economic collapse. There have been times when very drastic measures, such as wholesale destruction of plantations and crops, had to be taken to maintain the balance between production and consumption and to prevent prices from sinking to ruinous depths. To students of economics who seek to interpret the operation of economic laws in maintaining the trade value of world's commodities, this book carries a powerful message. Likewise, it has a peculiar literary appeal, for its author, who devoted five years to the study of coffee, is without doubt possessed of that rare gift of humanizing what in the hands of less accomplished authors would be a very drab subject to write about. The book contains much valuable information hitherto not of general public knowledge. It is the most complete treatise on the world's most popular beverage, the virtues of which are still being debated wherever it is drunk. The book itself is its best recommendation.—C. V. C.

College Men: Their Making and Unmaking. By Dom Proface. With a Foreword by Dean Theodore A. Distler. New York, P. J. Kenedy and Sons, c1935. 314 pp. Price, $2.15.

The book is a vivid portrayal of college life in all its aspects. It touches on society, ethics, religion, sex, love, health, ideals, and principles of character—the big items in life students are heir to. It is interestingly human with its bits of pathos and sparks of humor, the material having been excerpted actually from intimate interviews with college men. This book is highly commendable, not only for boys in college but also for parents and educators whose natural interest in them is paramount.
—J. M.

Food Studies. By Lula W. Gillum. Kansas City, Mo., Gillum Book Co., c1935. 624 pp., illus. Price, $2.

This is a very interesting and practical book written for girls in high school on food. The author presents the subject on the unit method, with an interesting introduction on health, the main objective of the ten-unit lessons. The text is provided with teaching aids, such as illustrations, questions, exercises, tests, tables, and references.

The average girl who has not oriented herself in her home kitchen or who has not learned to plan breakfast, luncheon, or supper, will find this book a great help. It is highly recommended for home economics classes in high school.—E. Y.

The Glorious Art of Home Cooking: How to Plan, Prepare, Serve with Recipes for Every Need. By Hannah Dutaud. Chicago, Associated Authors, c1935. 282 pp., illus. Price, $2.75.

A homemaker who is interested in peace and happiness in the home will find valuable help in this book. The peace of a family is greatly influenced by the food served to it, and malnutrition is known to be responsible for many unhappy homes. This book helps the homemaker become skillful and efficient in the preparation of foods; it aids her in the preparation of a well-balanced meal, which means the judicious selection of materials, the right combination of foods, and intelligent cooking. It gives detailed instruction in homemaking and housekeeping. Meal planning includes instruction in table service. The different foodstuffs with their tested recipes are classified and well explained, making the book very handy for reference.

This book will certainly make "A home a place of retreat where we journey not merely to be housed and fed but to be nourished and strengthened."—C. A.

The Identity Theory. By Blamey Stevens. 2d Edition, revised and amplified. New York, G. E. Stechert and Co., 1936. 243 pp. Price, $4.

Here is a book on the identity theory—the theory that all mathematical expressions of the laws of nature are really identities because they simply equate different measures of identically the same thing. The book is divided into twenty-two chapters, and each chapter into articles each presenting a single deductive or inductive argument. A number of definitions and principles are given first as scaffolding for the development of the theory. Then the theory is proved by the inductive method. Numerous mathematical expressions of fundamental laws of physics are shown to correspond with one of the above three classes of identity. Much depends on ingenuity in proving that an expression is an identity, much similar to finding the integral of an expression.

The book is hard reading. To obtain a full grasp of the theory discussed one must be well acquainted with mathematical physics, both classical and modern. A general reader, however, can obtain an idea of the character of the theory from the first three chapters and the introductions at the beginning of every chapter, without going into all the mathematics.—T. P. A.

The Medical Dictator; and Other Biographical Studies. By Major Greenwood. London, Williams and Norgate Ltd., 1936. 213 pp. Price, 7s 6d.

"That biographical sketches of men whose life work was technical, might still be readable" is the hope in which this book was written. It consists of biographical studies of seven medical men: Galen, John Friend, "Heart" Latham, William Farr, Louis, Osler, and Bacot. In a most vivid presentation of the lives of these men, the author has successfully produced an interesting book to be read not only by the medical man but also by the layman who wants to know these remarkable contributors to medical science.—M. B.

Medicolegal Cases; Abstracts of Court Decisions of Medicolegal Interest, 1931–1935. Compiled by the Bureau of Legal Medicines and Legislation, American Medical Association, Chicago, 1936. 888 pp. Price, $5.50.

This book represents an improved authoritative publication edited by the Bureau of Legal Medicine and Legislation of the American Medical Association, second to the initial volume previously published by the same Bureau as an experiment. It is a well-edited and arranged compilation, in an abstract form, of the most important court decisions of medicolegal interest, published in the journal of the American Medical Association during the calendar years 1931–1935, inclusive.

These decisions cover a wide range of civil, criminal, and administrative court cases within the broad medicolegal field and are therefore particularly important to physicians, lawyers, claim agents, government officers connected with accident and workmen's compensation, and the like. In fact, the comprehensive presentation in this book of the juridical, moral, sociological, and philosophical aspects of the professional relations of physicians to their patients, the society, the State and to each other, will be found increasingly valuable as a source of ready reference for the due understanding of the physician's rights, duties, and responsibilities in law. As has been rightly stated by the publishers in the Preface, "The idea prompting the publication of these abstracts in The Journal and in book form is not to qualify physicians to assume the rôle of counsel for themselves or for others, but rather to aid them in avoiding some of the legal and medical pitfalls into which their fellow physicians have fallen and to exemplify the medicolegal problems that have been before the courts, so that physicians may more intelligently meet such problems when they arise."

Physicians, lawyers, and others interested in avoiding legal difficulties and in solving medicolegal problems when they arise, will find this book a useful addition to their reference libraries. —S. A.

Modern Criminal Investigation. By Harry Söderman and John J. O'Connell. New York, Funk and Wagnalls Co., 1936. 461 pp. Price, $3.

The book describes dramatically the murderous characters of the underworld and the scientific technic of modern detectives in solving crimes of baffling nature. It shows the versatility of the agents of the law in following the tracks of criminals and, with scientific devices, being able to turn to advantage most trivial clues found in and within the vicinity of places of crime. Famous crimes of international notoriety have been reënacted, showing how they were solved with scientific technic. Finger prints and pictures as valuable aids in detection are covered in one chapter. These and many other interesting aspects of detection are fully discussed step by step, such as the description and differentiation of arms and tools used in crimes and their identification, identification of individuals, investigations of robbery, arson, sabotage, forgeries, and the police laboratory. In fact, this book covers practically every phase of police science, and should be a good text for colleges and schools for detectives and policemen. Sociologists and journalists will find the book instructive and delightful reading. The authors deserve high commendation for writing such an authoritative book on a difficult and delicate subject.—M. P. R.

Practical Dietetics: With Reference to Diet in Health and Disease. By Alida Frances Pattee. 20th edition, rewritten and reset. Mount Vernon, N. Y., A. F. Pattee, 1935. 868 pp. Price, $3.

This book, written by a well-known dietitian in the United States, is an authoritative discussion of practical dietetics with reference to diet in health and disease. The book is divided into three parts. Part I deals with principles of nutrition. The functions of food, the processes of nutrition, and the values and requirements of food are thoroughly discussed in conformity with the newer knowledge of the subject.

Diet in therapy is given in Part II, covering normal and basic hospital diets, diet in disease and in special conditions. It includes the most widely used diets of eminent physicians. Emphasis is laid on the fact that the diet in sickness is merely the diet in health modified to meet certain abnormal conditions.

The third part is the most interesting of the book, as it covers the practical application of the principles of nutrition, showing how the diet for both the well and the sick may be prepared. It would be very useful to dietitians especially.

The last part of the book furnishes tables on food values, different foods supplying the different food elements and weight-height-age tables which would facilitate computations on the part of professional workers.—E. Y.

Rayon and Synthetic Yarn Handbook; a Practical Reference Book for the Producer, Manufacturer, Processor, Distributor, Drycleaner, Launderer, Economist, and Student. By E. W. K. Schwarz and Herbert R. Mauersberger. 2d enlarged edition. New York, Rayon Publishing Corporation, 1936. 508 pp., 220 illus., tables, charts. Price, $3.75.

There are various interesting aspects of the book dealing with the manufacture, treatment, and identification of artificial silk—rayon. The historical background of the different processes used in the rayon industry is especially of interest to student beginners, and good reading for the average layman. The technical processes of selecting, preparing, and successive conversion of the raw materials into a rayon filament or artificial silk thread are described in a brief and simple manner.

The chapter on raw materials should prove important to alpha cellulose manufacturers as a valuable guide in the selection of suitable fibrous plants. It not only deals with possible materials but also gives a definite time of the year when they are to be gathered with maximum yield. Proper preparation and seasoning are also described in full detail.

Spinning, dyeing, weaving, and the manufacture of knit goods are technically treated in such a way that any one without technical training can understand them. The chapters on cleaning and laundering are also of practical value as they contain suggestions, precautions, and formulas to be followed in washing the goods, in order to lengthen the life of the cloth, make washing easier, and preserve quality and luster.

The illustrations of the various threads of synthetic fibers facilitate their identification. Chemical and microscopical technic of differentiating one fiber from the other are briefly described. The chapter on physical testing particularly offer a good guide in the selection of material for any specific purpose. The subtitle of this work indicates for whom the book is intended and it is recommended to them.—M. P. R.

The Great Soil Groups of the World and Their Development. By Dr. K. D. Glinka. Translated from the German by C. F. Marbut. Ann Arbor, Michigan, Edwards Brothers, Inc., 1935. 150 pp. Price, $3.

This book, an important contribution to soil science in general, is the embodiment of the Russian school of soil science. The geographic position of Russia is ideal for the systematic study of soils. As one moves from north to south over the vast plains of European Russia, the fairly homogeneous character of the topography with gradually changing climatic conditions as expressed by moisture and temperature is observed. This feature of the country made it imperative for the soil scientists in the field to study the soil in all its aspects.

The author has defined the soil clearly, and out of this definition evolved a system of classification. Several systems of classification by different authors are mentioned. The classification here presented and discussed by the author recognizes the climate, particularly moisture as the most important factor in the recognition of the several soil groups. The two groups under this classification are the so-called "Ectodynamomorphic" soils and "Endodynamomorphic" soils. The "Ectodynamomorphic" soils include soils developed under (*a*) optimum moisture conditions, (*b*) average moisture conditions, (*c*) moderate moisture conditions, (*d*) insufficient moisture conditions, (*e*) excessive moisture conditions, and (*f*) temporary moisture conditions. The "Endodynamomorphic" soils include the Rendzina and the various skeleton soils.

A comprehensive discussion of the various soils in the different groups covers almost the whole part of the book. To students of soil science whose work deals mainly with soil classification, this book is highly recommended. A wealth of reference is cited after the discussion of each subject matter.—D. Z. R.

Illustrated Guide to the Fish Gallery, British Museum (Natural History). By J. R. Norman. London, The Trustees of the British Museum, 1937. 175 pp., illus. Price, 1s 6d.

This booklet gives the reorganization of the exhibition of the Fish Gallery of the British Museum (Natural History). The first part deals with a general survey of the gallery, particularly with the fishes shown in the classificatory series. The second part, the major part of the guide, is devoted to the special exhibits of the arrangement of the Fish Gallery and the fishes on display, and should be most helpful to the curators of museums.

The accumulation of information on the fishes in the special exhibits is especially interesting and instructive to teachers and students of natural history and biology, as well as to sportsmen. The booklet is paper bound with six plates, one colored, and one hundred text illustrations. The index makes it a convenient reference work.—D. V. V.

The Vaccination Problem. By Joseph P. Swan. London, C. W. Daniel co., Ltd., 1936. 320 pp. *Price*, 5s.

This book may be regarded as an appeal for the abolition of all laws enforcing or encouraging vaccination against smallpox. It is a work in which the antivaccinationists can find solace, in the detailed exposition of perhaps all arguments against vaccination that satisfy the most discriminatory antivaccination taste.

It deals extensively with the history of the antismallpox vaccination movement, the fights and struggles which the antivaccinationists had to endure at the beginning, the origin and development of the antivaccination movement in England until the conscientious clause was included in the laws of England. It relates in detail the creation, work, accomplishments, and conclusions of the Royal Commission which conducted the inquiry regarding vaccination during the period of 1889–1896.

This book, although apparently an unbiased exposition of anti- and provaccinationist opinions, is in reality a passionate argumentation against vaccination. It describes the apparently contradictory opinions regarding the protection conferred by vaccination which at the time of the discovery was considered to confer absolute immunity, and does not consider the different conditions influencing vaccination in such a way that the duration of the immunity so conferred varies according to individual and other factors. It is firm in the belief of the duality of smallpox and vaccination. In its discussion of Dr. Wanklyn's book on the Administrative Control of Smallpox, it emphasizes the assertion that of the seventeen steps to be taken when smallpox break out that are included in the list only 3 relate to vaccination and consequently, after, the other 14 steps are observed, there will be no need to waste time and money on the remaining 3 on vaccination.

The author's review of the League of Nations Health reports contains unfavorable comments on what are believed vulnerable points. It is a book that will evidently be received with a cheer welcome among the antivaccinationists.—G. I.

Henley's Twentieth Century Book of Formulas, Processes and Trade Secrets. Edited by Gardner D. Hiscox. 1937 Revised and enlarged edition by Prof. T. O'Conor Sloane. New York, The Norman W. Henley Publishing co., 1937. 883 pp. Price, $4.

This 1937 revised and enlarged edition contains ten thousand selected household, workshop, and scientific formulas, trade secrets, and chemical recipes and processes. The editors "have endeavored to meet the practical requirements of the artisan, the housewife, and the general home worker." Several formulas for making adhesives, beverages, bleaches, concrete, essences and extracts, hair preparations, inks, insecticides, lacquers, shoe polishes, soaps, wood preservatives are given. Those interested in the field of manufacturing pharmacy and related industries will find the volume a useful source of information regarding recipes for creams, lotions, lipsticks, manicures, and other beauty preparations. Interesting information about chromium plating (Fink's Process) is also available from this work. The section dealing with new discoveries in photography offers valuable data to photographers, both professional and amateur. For the convenience of those who desire to have a ready reference to sources of supplies and materials needed in various formulas included in the volume, a classified buyers' guide giving the names and addresses of dealers handling such articles is given in a section of the book.—P. V.

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